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TRANSPORT AND FATE OF NITROAROMATIC AND NITRAMINE EXPLOSIVES IN SOILS FROM OPEN BURNING/OPEN DETONATION OPERATIONS:

MILAN ARMY AMMUNITION PLANT (MAAP)

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13. ABSTRACT *(Maximum 200 words)* This report describes soil column experiments (task 1) used to study fate and transport of OB/OD residues within the upper 1 m of soil. [Terrestrial (task 2) and aqueous (task 3) toxicity studies are reported elsewhere.] Intact soil-cores were collected from MAAP and also from Anniston Army Depot, Radford Army Ammunition Plant, and Pueblo Army Depot; results of these three studies are reported elsewhere. Soil columns were housed in controlled-environment chambers. Each soil column was formulated to approximate the major OB/OD residues found at the respective sites. Synthetic rainwater was added to the columns twice weekly, and a controlled tension applied. Leachates were collected twice weekly. Columns were analyzed at 6.5-wk intervals through 26 wk. Columns were cut into 2.5-cm transverse sections, and subsamples were air-dried, ground, and extracted. Extracts and leachates were analyzed by HPLC for explosives to reveal fate and transport behavior. RDX and HMX, measurable throughout in leachates, averaged 0.4 and 12 mg L^{-1}, respectively; while 2,4- and 2,6-DNT averaged 0.63 and 0.67 mg L^{-1} through day 58. Soil RDX migrated the full soil-core length by 6.5 wk, while soil HMX took 19.5 wk. Soil 2,4- and 2,6-DNT remained within the top 15 cm (6"), the A horizon.

14. SUBJECT TERMS

TNT	2,6-DNT	Munitions
TNB	2-Amino-DNT	Explosives
2,4-DNT	4-Amino-DNT	(Continued on page 2)

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PREFACE

The work described in this report was authorized under Project No. 89PP9914 and Sales Order No. 1HCB. This work was started in July 1989 and completed in May 1992.

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TRANSPORT AND FATE OF NITROAROMATIC AND NITRAMINE EXPLOSIVES IN SOILS FROM OPEN BURNING/OPEN DETONATION OPERATIONS:

MILAN ARMY AMMUNITION PLANT (MAAP)

1. INTRODUCTION

a. Out-of-date and out-of-specification munitions have commonly been disposed of by burning, or by detonation, on unprotected ground.[1] Through the promulgation of various environmental regulations, this practice has recently been limited. Burning pans and closed treatment systems have been used at various installations to mitigate environmental contamination. However, questions concerning the transport and transformation of open burning/open detonation (OB/OD) ash and waste explosives in soils and their environmental toxicity needed to be answered (AEHA, 1986).[2]

The standard practice of OB/OD of munitions historically involved quantities of explosives up to thirty tons per disposal event, and generated a mixture of contaminants into the immediate area at high concentration.[3] At many military installations OB/OD sites consist of multiple disposal areas. These OB/OD sites number in the hundreds, and have been developed and used by both the military and their civilian contractors during much of this century. Many of these sites have records inadequate to predict the nature and extent of the contamination. Residue from OB/OD contains both burned and unburned explosives, but environmental weathering and microbial action are known to produce modifications of these compounds.[4,5,6] Estimation of the environmental impact of OB/OD contamination at an individual site requires detailed knowledge of the type and amount of the chemical contaminants present and an understanding of their migration behavior within the soil.

The purpose of this project was to: 1) determine the transport and transformation of OB/OD contaminants in soil, 2) measure the toxicity of soils contaminated with explosives and 3) measure the toxicity of soil leachates. Three tasks were conducted to address the goals of the program. The first task used intact soil columns to measure the transport and transformation of chemicals in OB/OD ash and explosives of concern. The other two tasks involved determining the toxicity of explosives in soil to earthworms, and the toxicity of aqueous soil extracts to *Daphnia magna*.

In task one, intact soil cores were collected from Radford Army Ammunition Plant (RAAP), Virginia; Milan Army Ammunition Plant (MAAP), Tennessee; Pueblo Army Depot (PAD),

Colorado; and Anniston Army Depot (AAD), Alabama. The predominant explosives at each site were monitored in their respective soil-core columns for transport and transformation in the soil. Breakthrough and subsequent concentrations of the chemicals in the leachates collected from the columns were determined. Chemical transport and transformation experiments involved leaching soil columns with synthetic rainwater for up to 243 days. This report presents the data for Milan Army Ammunition Plant soils.

In task two, standard 14-day earthworm toxicity tests were conducted on OB/OD residues and specific explosives (results reported separately, in another technical report entitled **Toxicity of Selected Munitions and Munition-Contaminated Soil to the Earthworm *Eisenia foetida***).[7] In task 3, soil/water extracts were prepared, to partition water soluble biologically available components from the soil. These aqueous extracts were tested for toxicity to the aquatic organism *D. magna* (results reported separately, in another technical report entitled **Determination of Soil Toxicity to *Daphnia magna* Using an Adapted Toxicity Characteristic Leaching Procedure**).[8] The sensitivity of the *D. magna* method makes it a useful tool in assessing the impacts of contaminated soils. The results of this project will support site closure assessments at OB/OD sites, answer critical questions on the transport of explosives in soil, and address environmental toxicity data gaps.

Intact soil-core columns were collected on-site, to study the transport and transformation of munition residues in site-specific soils. Intact soil-core columns were collected rather than collecting bulk samples of soil for packed-column studies because soil physical and chemical characteristics are typically, sometimes dramatically, altered by the drying, sieving, and storing of soils necessary for preparing packed columns. Furthermore, such handling may also cause inappropriate and radical change in the ability of soil to degrade xenobiotics[9] or utilize naturally occurring compounds.[10] Intact soil cores offer the potential for a realistic view of site-specific soil conditions as they exist in the field, yet are portable so they may be studied closely in the laboratory under conditions that simulate those occurring in the field. If appropriate precautions are taken during the collection, transport, and study of intact soil cores, information obtained for site-specific soil conditions may also give added insight to the processes controling the transport and transformation of munition residues in soils. Many investigators acknowledge the advantages of using intact soil cores for study, but apply methods that require at least one transfer of the soil core from the collection probe to its destination column, potentially causing disruption of the soil core and alteration of its characteristics. However, a group of scientists[11,12] have developed a system for taking intact soil cores, and have applied the system to the extent that

it was accepted as a standard method for soil microcosm research by the U.S. Environmental Protection Agency[13] and the American Society for Testing and Materials.[14] The system used during the investigations detailed in this report is an adaptation of those soil microcosm methods, with various refinements to more realistically assess the transport and transformation of chemicals in soils.[15] The methods presented in the following section (II. Soil Methodology) describe these improved methods for 1) taking and directly delivering soil cores into their respective columns with minimal disturbance of the soil sample; and for 2) controlling environmental parameters of the soil cores during study including soil temperature and moisture regime, including quantity, quality, and intensity of simulated rainfall. These factors directly impact on the chemical, physical, and biological properties of the soil, and potentially affect the resulting transport and degradation of chemicals within soil[16] and their toxicity.[17]

MAAP was selected as the second site for collection of samples, characterization, and investigation. MAAP has open burning/open detonation (OB/OD) areas, and has burned waste explosives from their load/pack/assemble operations containing cyclotrimethylene-trinitramine (RDX), cyclotetramethylenetetranitramine (HMX), 2,4,6,-trinitrotoluene (TNT), 2,4-dinitrotoluene (2,4-DNT), and 2,6-dinitro-toluene (2,6-DNT). Burning operations were carried out on the surface of the soil, and contamination of the soil occurred due to OB/OD operations.

2. SOIL METHODOLOGY

a. Collection of Intact Soil Cores

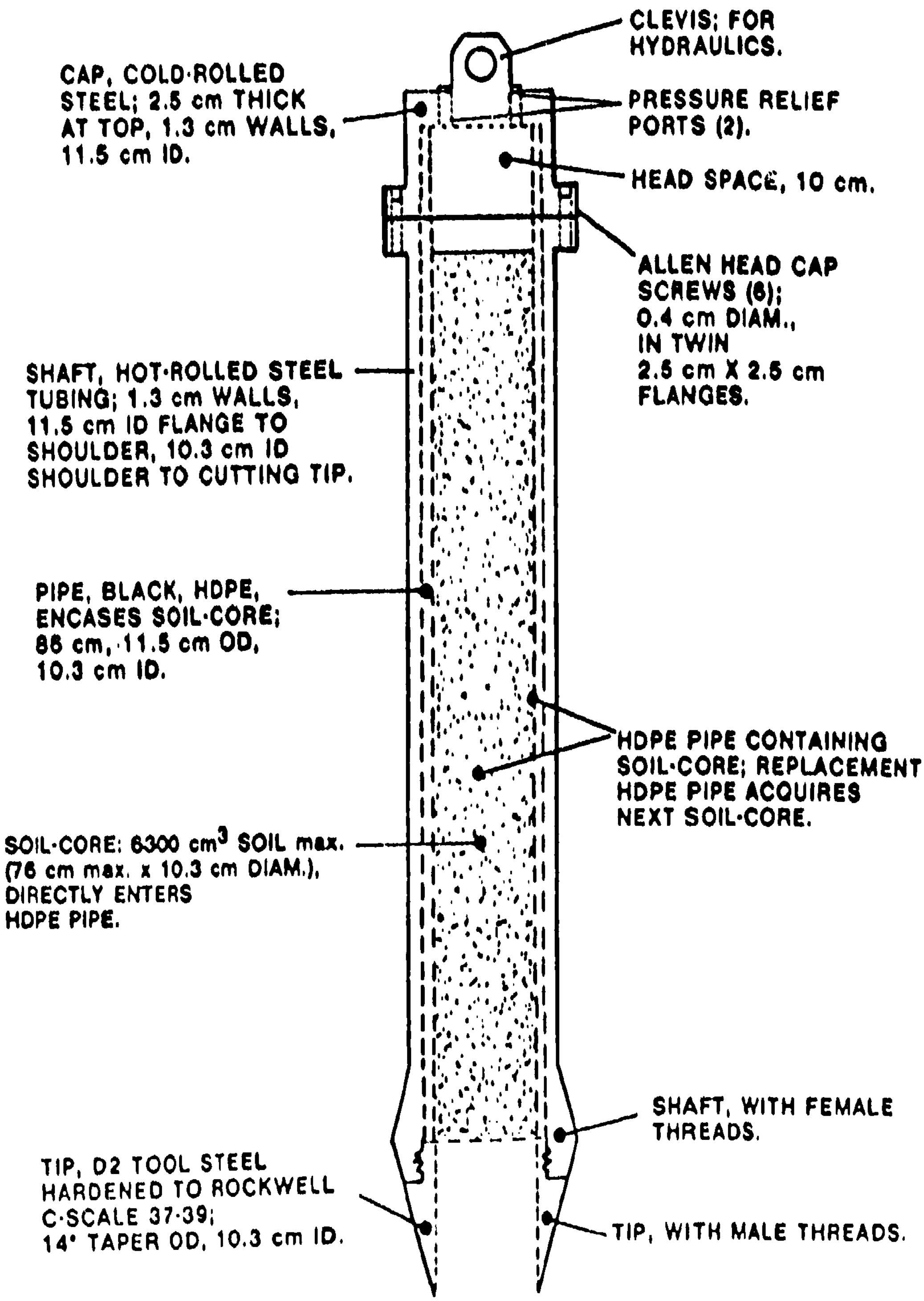
Prior to initiating collection of soil cores, a visual inspection of the OB/OD site was performed to ensure that the soil types conformed to those specified in the soil survey maps, obtained from the U.S. Soil Conservation Service.[18] Next, a site of the same soil type and characteristic as that of the OB/OD area was located. In order to be selected, a site must be free from contamination by munition residues, preferably undisturbed, and have an area large enough that sampling near soil-type transition areas or obvious physical discontinuities was avoided.

In the field prior to sampling on-site, the soil was brought to field moisture capacity. Watering of the soil was initiated at least 24h before sampling to ensure sufficient time for both wetting, and drainage of excess water. A sampling grid was then layed out at the site selected so soil-cores would be taken every 4 feet, on center. This was done to ensure that there was sufficient work area around each sampling location to prevent compaction of adjacent locations during sampling. Each site was measured and sampling locations were marked with flags. Native vegetation (primarily grasses) were cut at the soil surface and the aerial portions of the cut plants were removed prior to sampling the soil.

The probe (Fig. 2.1) was lifted into the air and moved to each sampling location using the front-end loader and a chain. An aluminum stop-plate, 18" x 18" x 0.5" (45 cm x 45 cm x 1.3 cm) with a central hole for locating the probe, was placed over the sampling location prior to pushing the probe into the soil. The stop-plate allowed more uniform samples to be taken. A total of thirty soil-core samples were taken per site to ensure an excess of available columns[19] from which to initially test and ultimately select the final twelve columns per study. The soil probe was pushed rather than pounded into the soil to alleviate zonal compaction and minimize disruption of the soil being taken.[20] To prevent distubance of the soil at adjacent sampling locations, the front-end loader was brought in perpendicular to the area in its approach to the first sampling location; after the sample was taken, the loader was backed out, moved to the right, again moved in perpendicular to the next sampling location; and this process continued until sufficient soil-core columns had been collected.

For the soil that entered the probe during collection of intact cores, the maximum clearance discrepancy allowed (using the tolerances specified, Fig. 2.1) during delivery of soil into the high density polyethylene (HDPE) pipe

FIGURE 2.1 CROSS-SECTION OF SOIL SAMPLING PROBE WITH SOIL-CORE ENCASED IN HDPE.



inside the probe was <0.05-cm, resulting in a soil-core diameter of 10.3-cm $\pm$<0.1. The HDPE pipe used in this study was opaque, the grade and quality used in high pressure gas pipelines. HDPE pipe was purchased in 12.2-m (40-ft) lengths, and prior to going to the field was cut and sanded to the specified dimensions. The HDPE pipe collection tubes were inert hydrophobic barriers that remained an integral part of the soil-core columns. Thus disruption of the soil due to column-to-column transfers was eliminated. Upon removal of the HDPE collection tube containing the soil-core from the probe, measurements were taken of the resulting head space within each column; additionlly it was advantageous to measure the depth of soil penetration by the probe that results from sampling. If dramatic inconsistencies occurred in the depth values in the field, the corresponding columns were rejected and others taken in their place. After removal from the probe, each HDPE collection tube containing a soil core was immediately placed in a set of "V" blocks for sealing and packaging. Each end of the HDPE collection tube was sealed with a barrier-cap consisting of double layers of 4-mil thick polyethylene sheeting, then sealed with duct tape to the HDPE pipe. This minimized gas exchange and prevented moisture loss from the soil cores. A sufficient supply of barrier-caps were prefabricated in the laboratory, prior to going to the sampling site, in order to decrease the amount of field time required to seal a soil-core sample tube. Barrier-caps were prefabricated by cutting out a 10" square piece of double-layered (2 x 4-mil) polyethylene sheeting, centering the square over an empty HDPE collection tube, and wrapping it around while pushing it down over the tube. This wrap was then held in place by a thick rubber band so a piece of duct tape could be placed tightly around the wrap 1" (2.5 cm) from the end of the HDPE collection tube. The corners of the square wrap (excess) were then cut off around the tube 2" (5.0 cm) below the tape. When using these barrier-caps in the field, the barrier-cap is slipped onto the end of the HDPE collection tube and an additional piece of duct tape is used to completely seal the edge of each barrier-cap to the outer surface of the tube. After the ends were sealed, each tube was labeled with the date, location, and collection site number.

Collected soil cores in their HDPE tubes were placed into 32-gal (120-L) opaque polyethylene containers, which contained a 6" (15 cm) thick foam rubber pad in the bottom. A group of HDPE tubes were placed on the pad in each container with the soil end down. The sealed columns extended out of the top of the containers, and through the container covers which had been cut to fit the columns. Black polyethylene plastic bags were used to cover the tops of the sealed columns. All soil samples obtained from a site were transported back to the laboratory upright in padded containers to minimize disruption of the soil cores during transport.

b. Soil Column Preparation and Testing

Afterward in the laboratory, selected soil-core columns were trimmed of excess soil if any was present, fitted with a porous ceramic disk (2.5 um pores) in opaque HDPE endcaps containing fittings for teflon tubing with in-line monitoring and shut-off valves (Fig. 2.2). The HDPE end-caps used in this study were the grade and quality used in high pressure gas pipelines, however prior to use each was milled to contain a well for the controlled-pore ceramic plate, then milled again and threaded for tubing fittings. End-cap fittings were also HDPE. The intact soil-core columns were then transferred into the controlled temperature (controlled environment soil-core microcosm unit; CESMU) chamber (Fig. 2.3). The CESMU chamber was housed in a greenhouse for high-temperature control, and was equipped with 10.5 MJ h^{-1} cooling capacity sufficient for maintaining a constant temperature within entire soil columns for isothermic studies at 25.0 $\pm$0.1 ^{o}C. During these investigations the tops of the columns were left open to receive sunlight, sufficient for plant growth (however, they could instead be covered with an opaque insulated cover spanning all columns to eliminate photodegradation processes). Controlled tension (vacuum) was applied equally at the bottom of each soil column across the controlled-pore ceramic plate, at 30-35 kPa; tension was regulated and monitored.

The tension that was applied is comparable to that encountered in the field as a result of combined soil matric and gravitational forces; thus avoided were undue flooding, the buildup of a hanging column of water in the lower portion of columns, and artificial changes in soil redox potential in response to steady-state alteration of the soil water content, as can happen when gravitational forces alone are relied upon to promote water flow through soil columns. Before initiating any studies of the fate, migration, and degradation of munition residues, the soil-core columns in the CESMU chamber were saturated with water and equilibrated under tension (48h minimum), after which water thru-put was evaluated for each of the initially selected columns.

The initial selection of twelve columns per soil type (site) for preliminary testing was done on the basis of similarity of head space within columns, an easily obtained measurement that is the compliment to column length. Using the sampling methods and measurements described above, a group of columns differing in length by only centimeters (Fig. 2.4) was obtained that provided a sufficient number of columns from which to select those for the preliminary testing of water flow (thru-put). Soil-core columns were initially selected on the basis of similarity of length; and replacement columns within each soil type group, if needed, were those with the next closest to the mean length. For the

FIGURE 2.2 SOIL-CORE COLUMN INCLUDING END-CAP AND FITTINGS.

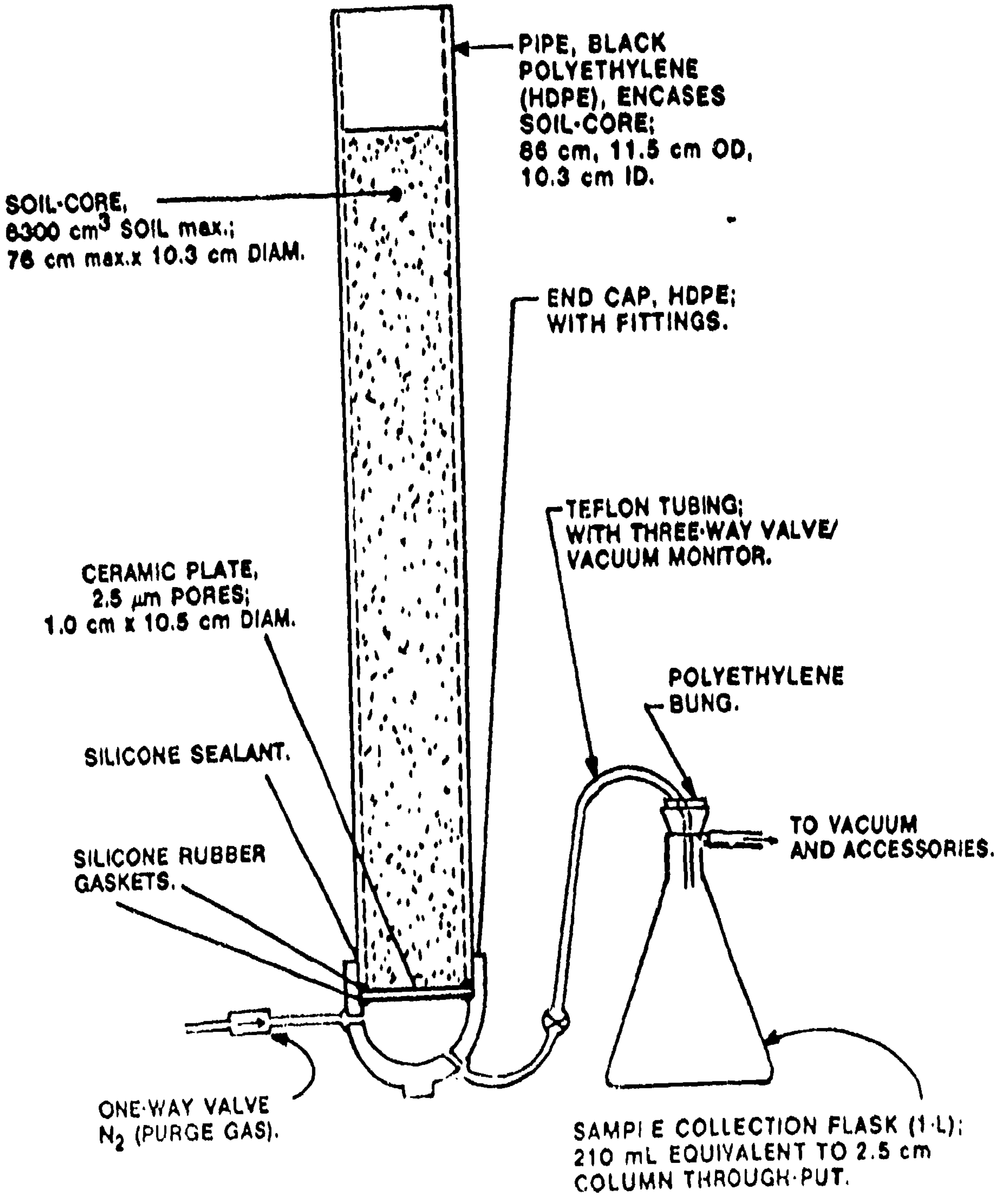


FIGURE 2.3 CROSS-SECTION OF CESMU SYSTEM SHOWING ONE SOIL-CORE COLUMN AND VACUUM SYSTEM.

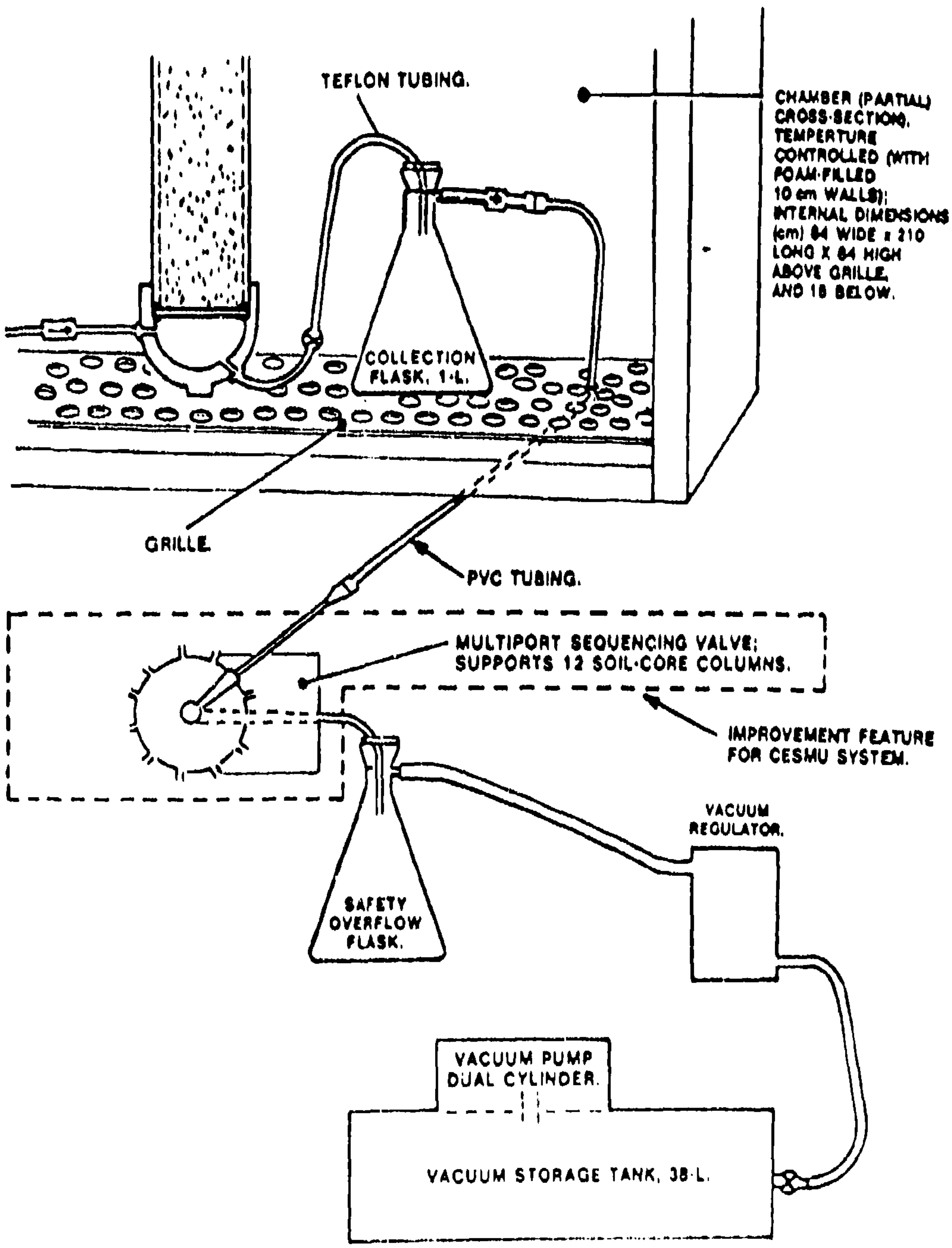
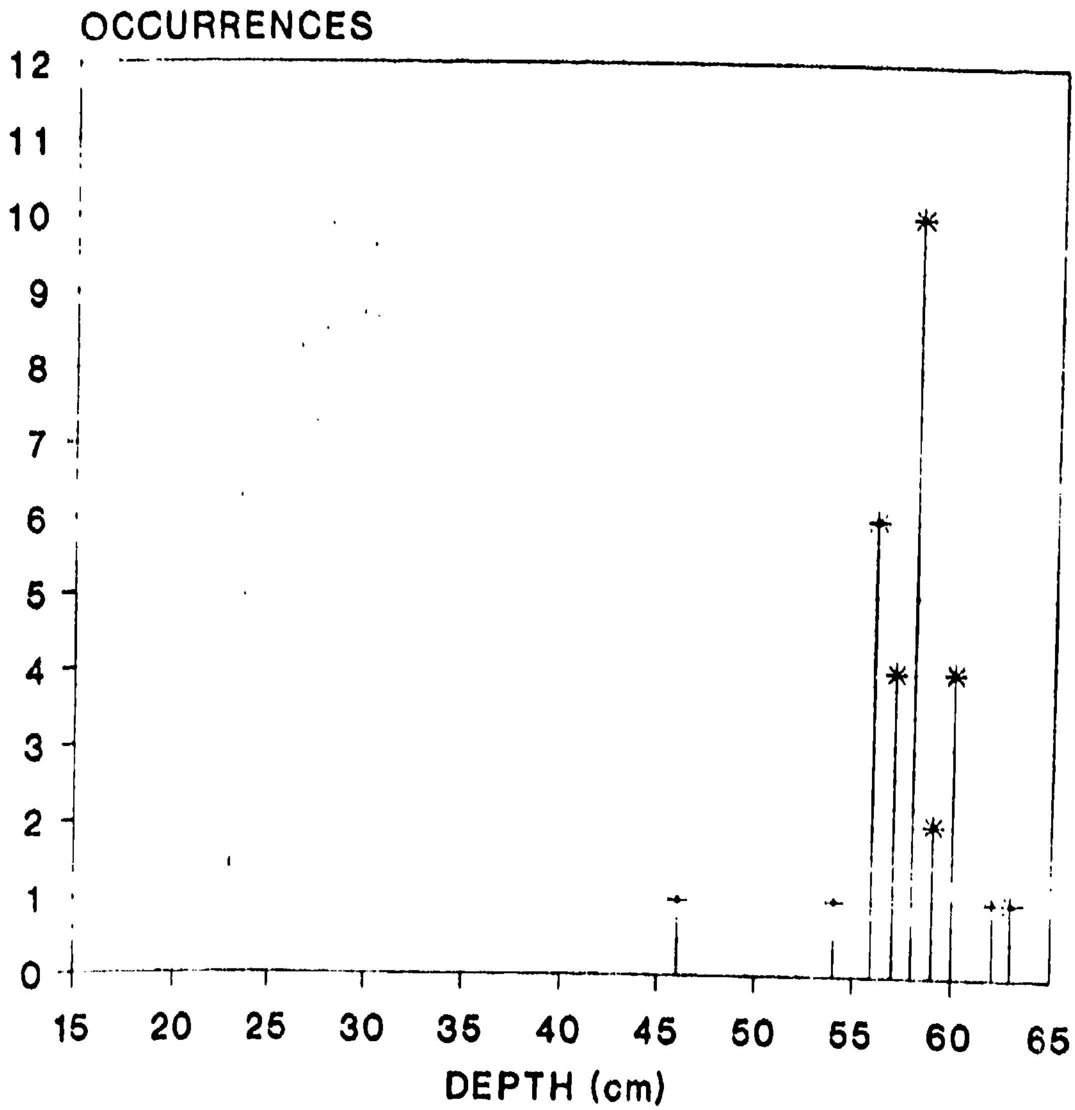


FIGURE 2.4 FREQUENCIES OF SOIL-CORE COLUMN DEPTHS: LEXINGTON SILTY LOAM SOIL (MAAP).



initially selected columns that were found to have rates of flow or water thru-put substantially different than the median, replacement columns were selected, and then similarly evaluated. Outlier-columns within each soil type (based on values of water thru-put, when water was applied, monitored, and sampled analogous to artificial rain additions described below) were replaced until the standard deviation about the mean value for water thru-put was $\leq 10\%$. Then, based on the adjusted mean excluding outliers, any additional columns with thru-put values falling outside of the adjusted mean $\pm$original standard deviation were also replaced, until all test columns fell within one standard deviation of the mean. Representative columns were thus identified and retained for study in the CESMU chamber.

c. Spiking of Soil Columns

OB/OD contaminated soil was collected from an open detonation pit that had the most recent disposal operation. This contaminated MAAP soil was air-dried, extraneous materials (nails, stones, etc.) removed, crushed, and ground to pass a 2-mm nylon seive. After this, the type and quantity of munition residues was determined. Then a mixture of the prepared detonation pit soil and explosives, related to munition residues detected in the screening analysis, was prepared. After twelve representative soil columns collected from the site were identified and randomly placed in the CESMU according to the specifications in this report, the soil and explosives mixture (spike) was added atop the soil surface of the randomly assigned treatment columns. During preparation of the mixture 1000 mg kg^{-1} (ppm) each of TNT and 2,4-DNT, and 400 mg kg^{-1} 2,6-DNT were incorporated into the spike. Each of ten treatment soil columns from the MAAP site received a mass of spike equivalent to 1" (2.5 cm) of the spiked soil mixture (yielding approximately 210 mL of the mixture, after settling), while the two control columns received a mass of uncontaminated soil from the site equivalent to 1" (2.5 cm) of the uncontaminated native soil.

OB/OD ash in soil (ash/soil) was collected, air-dried, extraneous materials (nails, aluminum foil, etc.) removed, crushed, and ground to pass a 2-mm nylon seive; then the type and quantity of munition residues was determined. A mixture of the native ash/soil and the type of munition residues detected in the screening analysis was prepared. After twelve representative soil columns collected from the site were identified and randomly placed in the CESMU according to the specifications in this report, the mixture of ash/soil and explosives was added atop the soil surface of the randomly assigned treatment columns. During preparation of the mixture 1000.0 mg kg^{-1} (ppm) each of RDX, HMX, and 2,4-DNT, and 400 mg kg^{-1} 2,6-DNT were incorporated. The spiking mixture was then analyzed and determined to contain the following concentrations of acetonitrile extractable explosives and transformation products (mg kg^{-1}): 1260 $\pm$80 RDX, 1020 $\pm$80

HMX, 640 ±50 2,4-DNT, 250 ±20 2,6-DNT and a trace of TNT. Each of nine treatment soil columns from the MAAP site received a mass of ash/soil equivalent to 1" (2.5 cm) of the ash/soil mixture (yielding approximately 210 mL of the mixture, after settling), while the three control columns received a mass of uncontaminated soil from the site equivalent to 1" (2.5 cm) of the uncontaminated native soil.

d. Simulated Rainfall and Resulting Leachates

In the laboratory, synthetic rainwater was formulated based on records of the constituents of rainfall across Pennsylvania,[21,22,23] and used to represent the constituents and characteristics of rainfall in the mid-Atlantic coastal region. The constituents of the synthetic rainwater were (*uM*, in deionized water) 15 SO_4, 11 NO_3, 9 Cl, 25 NH_4, 7 Ca, 3 Mg, 3 Na, and 2 K; pH was adjusted to 4.60 ±0.02 using a 1.35:1 mixture of 1*M* H_2SO_4 and 1*M* HNO_3. Synthetic rainwater (pH 4.60 ±0.02) in the amount of 0.2" (0.6 cm) was administered at the top to the center of each soil-core column twice a week at the rate of 1" h^{-1} (7 *um* s^{-1}) using a peristaltic pump.[15] Resulting leachates were collected into vacuum flasks and kept at soil column temperature (25.0 °C). Leachates were harvested twice-weekly, and analyzed for munition residues and transformation products; the pH of leachates was determined at the time of collection. The maximum duration of leaching was 32.5 weeks.

e. Harvest of Soil Columns

Replicate soil columns were harvested at regular intervals following leaching, sealed (in the same manner as when collected from the field, Section 2.b), then frozen. Afterward, the frozen soil cores encased in HDPE pipe were carefully cut open using a router (with the depth of penetration set to the wall thickness of the HDPE tubes) and a hand guide, allowing the resulting intact soil core to rest in the lower half of the HDPE pipe. Soil cores were then slowly thawed in the horizontal position to effectively eliminate longitudinal migration. Then from top to bottom, the soil cores were marked into sections using a spatula to indicate 1" (2.5 cm) depth intervals. The soil was then sectioned into 1" depth x 4" diam. (2.5 cm x 10.3 cm) discs. Each disc was individually transferred into a clean polyethylene bag, air-dried, crushed, and ground to silt consistency (≤150 um). Using similar sectioning methods but larger section sizes, replicate bulk density determinations were done individually for A and B horizons using the extra soil-core columns.

Two of the soil-core treatment columns were randomly selected and harvested after each designated leaching interval. Harvesting of columns occurred after 6.5, 13, 19.5, 26, and 32.5 weeks of leaching, for a total harvest of ten treatment columns. The two control columns were harvested after

32.5 weeks of leaching, along with the final treatment columns. Column harvest, sectioning, and preparation for analyses, are described in this report (above).

f. CESMU System Integrity

Although controlled tension was applied equally at the bottom of each soil-core column during studies and was regulated and monitored, the failure to maintain tension at any single column potentially affected the tension on the remaining columns until the failing column was repaired or eliminated. Generally this problem occurred only during the set-up and preliminary testing of columns, and resulted from an immediately repairable minor leakage. Infrequently this problem occurred due to handling of system components during sampling of leachates, but again caused only minor leakage of vacuum and was easily and immediately repairable.

Physical and mechanical systems supporting the CESMU chamber and rainfall delivery functioned well under almost constant use for more than two years. Over this period, the transport and transformation of munition residues were investigatied in four different site-specific soils, using twelve study columns per soil type (site), with individual studies lasting from six to nine months depending upon the availability of chemicals investigated. During these studies only one study-column failed out of fourty-eight total columns selected for investigation, and the remaining soil columns had relatively constant outputs within respective soil types.

Mechanical-part failures during this period included only one vacuum pump failure (replaced with a back-up unit while the original was rebuilt), and one vacuum regulator that failed inspection during an investigation and was immediately replaced with a back-up unit. Performance of the physical and mechanical systems was high, providing high confidence in maintenance of the conditions and limits designed for the studies.

g. Determination of Selected Soil Parameters

For this investigation several soil physical and chemical parameters were selected for determination by the University of Maryland Soil and Plant Testing Laboratory, College Park, MD. The soil properties chosen were selected to more fully characterize and understand the role of the effects of specific soil properties on the transport and transformation of munition residues, and their transformation products. Soil properties determined included percent sand, silt, clay, and organic matter, the cation exchange capacity (CEC), and soil pH.

3. DETERMINING MUNITION RESIDUES AND THEIR TRANSFORMATION PRODUCTS

a. Analytical Methods Development Using High Performance Liquid Chromatography (HPLC)

The quality control program for this study was based on a system that assessed sample preparation, analyte recovery, and analytical precision and accuracy. Details of this program are presented in Appendix A.

Our approach to analytical determinations supporting these investigations was based on a two step process. The first step was qualitative analysis of contaminated surface samples to screen for compounds present in environmentally significant concentrations. Due to the variety of military explosives and their environmentally modified forms, a new method was required to chromatographically isolate and thus identify the majority of the compounds likely to be encountered. The second step was quantitation of these contaminants in soil and in water that leached through this soil. Screening and quantitation processes required different HPLC methods because quantitation required greater analytical sensitivity than the screening method could provide.

Sample preparation and extraction procedures were adapted from a method developed and extensively tested by Jenkins[24,25,26]. These modified procedures entailed grinding air-dried soil samples, and extracting into acetonitrile with 18 hours of sonication at 20°C. Extracts were then centrifuged at 3900 X G for 15 min, and analyzed by HPLC. The latter portion of the sequence differs from Jenkin's method in that a step requiring mixing the acetonitrile extract with an aqueous floculating solution was eliminated, and that the internal standard 1,3-dinitrobenzene (DNB) was incorporated.

An estimation of the efficiency of extraction of each compound was obtained by doping subsamples of uncontaminated surface soil with acetonitrile containing a mixture of selected OB/OD compounds plus DNB. The soil was air-dried and extracted as above, and the efficiency of extraction was calculated from the amount of each compound recovered. Because the efficiency of extraction of the OB/OD components at our test sites was similar to that of DNB, a simplified recovery correction system was possible. All soil samples were extracted with acetonitrile containing 2.5 mg L^{-1} (ppm) of DNB as an internal standard. Observed concentrations of OB/OD components in the extraction mixture were corrected for losses of internal standard that occurred during the extraction process. Corrections were also made for any increases in concentration due to evaporation of the extraction solvent.

Aqueous leachates were directly analyzed for

munition residues and degradation products. These determinations were done without any preconcentration, internal standardization, or other preparation.

HPLC analyses of leachates and soil extracts were done using a Hewlett-Packard (HP) 1050 HPLC system that consisted of an autoinjector, pumping module, and UV detector. Signal integration was performed with an HP 3396A integrator. All analyses except screening tests for the presence of NG were done by UV absorbance at 244 nm. NG was determined at 220 nm.

Extracts of uncontaminated soils (background) and highly contaminated surface soils were screened by the gradient method developed for this investigation. A 15-uL sample was injected onto a 4.6 X 250 mm Rainin Microsorb C18 column with a 5 um particle size, in series with a 4.6 X 250 mm Supelcosil LC-PAH column. Elution was accomplished with a methanol:water gradient (Table 3.1).

A simpler isocratic method (developed elsewhere by Miyares and Jenkins[27]) was used to substantiate identification and to quantitate contaminants. This isocratic method entailed isocratic pumping of a mobile phase of 70.7% water, 27.8% methanol, and 1.5% tetrahydrofuran, at a flow rate of 2 mL min^{-1}

Table 3.1 HPLC Time/Gradient (Methanol:Water Mixture) for Initial Screening of Samples for a Broad Range of Munition-Related Analytes and PAHs.

Time (min)	Percent Methanol (% MeOH)
0	30
1.5	33.5
6.0	47.5
24.0	51.0
35.0	54.5
60.0	100.0
80.0	100.0

through a 25 cm x 4.6 mm Supelco LC8 column of 5 um particle

size. This procedure was modified by the addition of an acetonitrile gradient to minimize peak-broadening when amino-dinitrotoluenes (amino-DNTs) were quantitated.

b. Results of HPLC Methods Development

The above procedures have proven effective in recovering and quantitating OB/OD residues in all soils tested (Table 3.2); they have the additional advantage of being simple and reproducible. However, several shortcomings were encountered. Efforts to identify some minor components of the OB/OD soil contaminant mixture were not successful due to interferences from natural soil components. Although the majority of UV-absorbing soil components elute from reverse phase chromatography before most explosives, some elute at later retention times causing a rough baseline at high sensitivities thereby making quantitation of extremely small peaks unreliable.

Table 3.2 Efficiencies of Recovery of Selected Munitions, from Soil and Water.

	Percent Munition Recovered (%), ±s		
	From soil extracted with acetonitrile		From aqueous leachate concentrates in MeOH
Compound	doped uncontam.	doped contam.	
RDX	95 ± 1	91 ± 2	38 ± 1
HMX	99 ± 6	112 ± 4	29 ±10
TNT	107 ± 1	94 ± 9	90 ± 4
2,4-DNT	103 ± 1	110 ± 5	108 ± 7
2,6-DNT	103 ± 1	103 ± 2	104 ±20
2-Amino-DNT	100 ±<1	103 ± 1	112 ±15
4-Amino-DNT	98 ± 3	102 ± 4	137 ±40
TNB	102 + 2	114 ± 3	123 ± 3

The gradient procedure presented here effectively separated components of a mixture that included most compounds likely to be encountered during analysis of soils from OB/OD contaminated sites (Fig. 3.1). It was able to detect many

1 Nitroguanidine (NQ)
2 2,4,6-Trinitrophenol (Picric acid)
3 1-Acetyloctahydro-3,5,7-trinitro-1,3,5,7-tetrazocine (SEX)
4 Cyclotetramethylenetetranitramine (HMX)
5 1-Acetylhexahydro-3,5-dinitro-1,3,5-triazine (TAX)
6 Cyclotrimethylenetrinitramine (RDX)
7 1,3,5-Trinitrobenzene (TNB)
8 1,3-Dinitrobenzene (DNB)
9 2,4,6-Trinitrophenylmethylnitramine (Tetryl)
0 2,4,6-Trinitrotoluene (TNT)
1 4-Amino-2,6-dinitrotoluene (4-Amino-DNT)
2 2-Amino-4,6-dinitrotoluene (2-Amino-DNT)

13 2,6-Dinitrotoluene (2,6-DNT)
14 2,4-Dinitrotoluene (2,4-DNT)
15 Naphthalene
16 Acenaphthylene
17 Fluorene
18 Phenanthrene
19 Anthracene
20 Fluoranthrene
21 Pyrene
22 Benz(a)anthracene
23 Chrysene
24 Benzo(a)pyrene

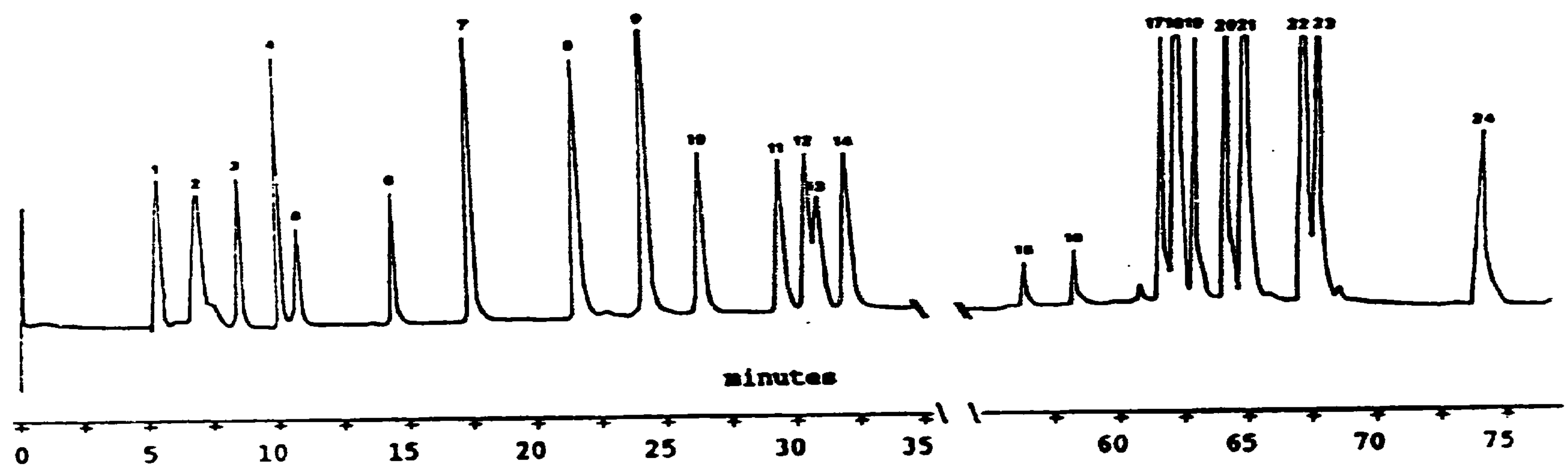


Figure 3.1 HPLC chromatogram showing the separation of a series of munition residues, environmental degradation products of explosives, and PAHs, using the gradient chromatographic (screening) method.

compounds that would otherwise be missed by previous methods, and produced sharp symmetrical elution peaks for all compounds tested. However, this chromatography required 90 min to complete, and could not be used as a routine procedure at high sensitivity (compounds <1 mg L^{-1}) because of problems with baseline drift. The isocratic HPLC method of Miyares and Jenkins proved effective in quantitating intact RDX, TNT, and DNTs (2,4-, and 2,6-dinitrotoluene) in water, acetonitrile, and methanol but performed less well with the aminodinitrotoluenes because they were later eluting and exhibited significant peak broadening (Fig. 3.2). Peak broadening caused problems with quantitation because it caused erratic start times during electronic integration of peak areas. We also observed that this solvent and column combination was unusually sensitive to temperature. At room temperatures the large negative absorbance peak from acetonitrile interfered with the quantitation of HMX. At temperatures above 23°C retention times were shortened, and at 30°C the system no longer resolved the two aminodinitrotoluenes.

Recovery of explosives doped into uncontaminated soil were nearly quantitative (Table 3.2); adjustments of recoveries due to gain or loss of the DNB internal standard were insignificant. Conversely, recoveries from the soil and water after leaching experiments ranged from 10-15% for TNT, 2-5% for 2,4-DNT, and even less for 2,6-DNT. Due to these low recoveries of the nitroaromatics from the leached soils, the concentrations of explosives in soil extracts, and in aqueous leachates, were often diminished to levels below our criteria of detection. The criterion of detection is defined as the lowest certifiable limit for quantitation. The respective criteria of detection were calculated using the computerized Quality Assurance Program of the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA),[28] based on the methods of Hubaux and Vos.[29] Criteria of detection values were determined separately for leachate (aqueous) and soil samples for each explosive and transformation product, with details and calculations given in Appendix B. Criteria of detection for selected compounds are presented in Table 3.3, as a function of sample matrix.

When a compound was identified but quantitated to be at levels below the criteria of detection, it was termed to be a "trace" quantity and identified as < criterion of detection; a zero value (0) was reported when "no peak" was registered by the integration unit of the HPLC (i.e. not detectable) under the analytical conditions described in this report (above).

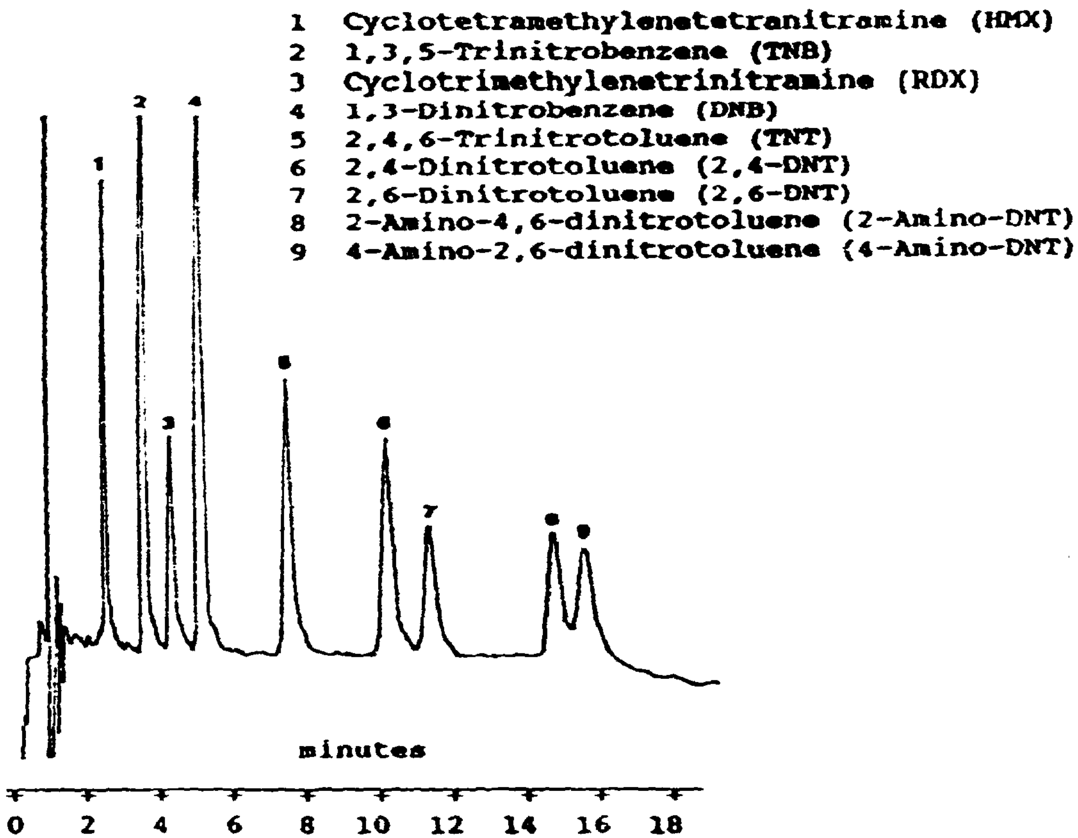


Figure 3.2 An example of the separation of a series of munition residues and associated co-contaminants, by the isocratic HPLC method[12].

Table 3.3 Criteria of Detection* for Selected Explosives and Their Transformation Products for Leachate (Aqueous) and Soil Samples.

Compound	Criteria of Detection by Sample Matrix	
	Leachate ($mg\ L^{-1}$)	Soil ($mg\ kg^{-1}$)
RDX	0.07	5.8
HMX	0.14	2.9
TNT	0.09	6.1
2,4-DNT	0.17	5.7
2,6-DNT	0.37	5.2
2-Amino-DNT	0.14	15.4
4-Amino-DNT	0.12	14.6
TNB	0.15	2.4

* Calculations detailed in Appendix B.

c. Analytical Methods for Metals Determinations by Atomic Absorption Spectrophotometry

Concentrations of Cd, Cr, Cu, Pb, and Zn in uncontaminated soils and OB/OD contaminated ash/soil mixtures from each of the four OB/OD sites were determined in order to compare the background levels of metals in the respective soils with those of the contaminated/fortified (spiked) samples. Complete results from these analyses are reported in Appendix C. Duplicate 4.00 ±0.02 g air-dried subsamples from each of the uncontaminated, contaminated, and contaminated/fortified (spiked) soils were each heated for 3 h on a hot plate in 20 mL 1.0 *M* trace-metal grade HNO_3. When the samples were cool, each was filtered by gravity through Whatman #50 paper, then brought to 50-mL volume with ultrapure water (reverse osmosis followed by double-deionization). All samples were analyzed for total extractable Cd, Cr, Cu, Pb, and Zn levels by atomic absorption spectrophotometry (Perkin-Elmer Model 3030 AA Spectrometer).

Quality assurance and control (QA/QC) for the metal determinations were achieved as follows. Absorbance and

concentration values for standard solutions were initially assessed to assure compliance with the values listed in the Perkin-Elmer methods guide. Standard solutions of the metals were periodically reread (absorbance redetermined) throughout the analyses for each metal determined, to check for instrument drift. Blank solutions were analyzed to detect any possible metal contamination. Additional subsamples were selected at random and prepared in replicate, to verify the analytical results obtained in initial analyses.

4. MILAN ARMY AMMUNITION PLANT (MAAP)

a. Results

i. Soil Parameters

The soil type at the MAAP OB/OD area consisted of Lexington silt loam soil (Fine-silty, mixed, mesic, thermic Typic Paleudalfs),[18] thus soil of this type was sought in an uncontaminated area on-site. Physical and chemical analyses of soil from the uncontaminated site confirmed the Lexington silt loam soil type. These soil parameter results are presented in Table 4.1.

Table 4.1. Physical and Chemical Characteristics* of Lexington Silt Loam from the Uncontaminated MAAP Site.

	SURFACE A HORIZON (0-15 cm) 0-6 INCHES	SUB-SURFACE B HORIZON (15-68 cm) 6-27 INCHES
SAND %	28	43
SILT %	54	38
CLAY %	18	19
ORGANIC MATTER g/kg	16	5
CEC $cmol_c/kg$	9.2	6.6
pH	4.8	5.5

* Values represent replicate determinations by the University of Maryland Soil and Plant Testing Laboratory, College Park, MD.

Concentrations of all metals studied were higher in the contaminated ash/soil than the uncontaminated Lexington silt loam soil (Appendix C). The concentration of each metal in contaminated ash/soil was divided by the concentration in uncontaminated soil to reveal the anthropogenic elevation, in percent. Thus relative concentrations of metals in contaminated ash/soil were expressed as percentages of the values from uncontaminated background soil, followed by the determined concentration values (mg kg^{-1}) for the contaminated ash/soil: Cd 1600% (9.0), Cr 760% (47), Cu 9900% (928), Pb 5600% (534), and

Zn 5200% (2496). On the basis of the anthropogenic elevations alone, the greatest potential environmental hazard from metallic residues at MAAP appear to be due to the elevated Cu, Pb, and Zn concentrations in OB/OD contaminated soil.

Twelve uncontaminated Lexington silt loam soil columns having soil-core depths that were the most similar to the median were selected for preliminary evaluation in accordance with the procedures described in this report. Nine of these met the thru-put criteria while three did not. A total of seven additional columns were tested before adequate replacement columns were identified, according to the test criteria. Using these procedures a set of twelve soil-core columns, selected for spiking with contaminated MAAP ash/soil, was successfully identified for further investigation.

ii. Leachates

The volumes of leachates collected are given as a function of time in Appendix D, Table D-1. Concentrations of munition residues in leachates from MAAP soil-cores were determined by HPLC methods described in this report. The concentrations and quantities (masses) of munition residues in the leachates harvested from the MAAP Lexington silt loam soils are given in Appendix D, Tables D-2 and D-3, respectively. Results are summarized in Figures 4.1 through 4.4.

Concentrations of HMX and RDX in MAAP soil leachates were measurable throughout this study, averaging 0.4 and 12 mg L^{-1} (ppm) respectively (Fig. 4.1). Concentrations of both HMX and RDX in leachates tended initially to increase quickly as leaching progressed, and then to plateau. Leaching of the contaminated Lexington silt loam soil produced two distinct leachate mass profiles for both HMX and RDX (Fig. 4.3 and 4.4.), with four of the eight treatment columns producing Type 1 profiles while the remaining four produced Type 2. Figure 4.2 gives the concentrations of 2,4- and 2,6-DNT in leachates from MAAP soil. The line drawn (Fig. 4.2) represents the best linear fit for the 2,4-DNT (<>) data, but the same general trend was followed by the 2,6-DNT (x) data. Concentrations of both 2,4- and 2,6-DNT in leachates tended to decrease over time as leaching progressed, and tended to be similar in value. From commencement of leaching through day 58, the concentrations of 2,4- and 2,6-DNT in leachates averaged 0.63 and 0.67 mg L^{-1} (ppm) respectively; and from commencement of leaching through day 108, averaged 0.46 and 0.41 mg L^{-1} respectively. The final quantifiable concentration of 2,4-DNT in leachate ($\geq$0.17 mg L^{-1}, criterion of detection) was 0.23 mg L^{-1} and occurred on day 129; and the final quantifiable concentration of 2,6-DNT in leachate ($\geq$0.37 mg L^{-1}, criterion of detection) was 0.42 mg L^{-1} and occurred on day 63. Initially five of the ten treatment columns yielded leachates containing low concentrations of TNT, ranging

from 0.09 to 0.21 mg L^{-1}. These already very low concentrations of TNT in leachates decreased quickly as leaching progressed, and after day 10 there were no quantifiable concentrations of TNT ($\geq$0.09 mg L^{-1}, criterion of detection) in any of the leachates. During this investigation no transformation products of HMX, RDX, 2,4-DNT, 2,6-DNT, or TNT were detected in any of the leachates from the MAAP Lexington silt loam soil.

The average pH values for each leachate harvest are given in Table 4.2. Generally, the pH of leachates were initially a few tenths of a pH unit higher than the pH range of the soil, pH 4.8 in the surface A horizon to pH 5.5 in the lower B horizon (Tables 4.1 and 4.2). Overall, as leaching progressed the pH of leachates decreased slightly; as the soil-core columns received 1.4" (3.6 cm) synthetic rain (pH 4.60 $\pm$0.02) per week. The average pH of leachates differed by $\leq$1 pH unit for 96% of the leachates samples, over the course of 183 days; with the greatest difference in leachate pH equaling only 1.2 pH units.

iii. Soil

Concentrations of munition residues in MAAP soils were determined by the HPLC methods described in Sections 2.d and 3 of this report. Results of analyses for each soil-core section, from all MAAP treatment and control soil-core columns, are given in Appendix D, Tables D-4.1 through D-4.10.

The munition residues and transformation products that were present in treatment soil-core columns at commencement of column leaching included RDX, HMX, 2,4-DNT, 2,6-DNT, and a trace of TNT. During this study of the transport and transformation of these munition residues, no transformation products of these compounds were found. The results for HMX and RDX from duplicate treatment soil-core columns are summarized in Figures 4.5 through 4.8 by time of leaching/harvest; no munition residues were found in triplicate control columns. Generally, as leaching of the contaminated soil progressed, HMX was found at progressively greater depths within the Lexington silt loam soil; while RDX was transported through the soil so quickly that it was found at all depths even at the first harvest of soil-core columns, 6.5 weeks after commencing leaching. Neither TNT or TNB (a transformation product of TNT that is frequently found in surface soils at concentrations exceeding that of the parent compound)[30] were found in the contaminated Lexington silt loam soil, although this result was not unusual since extractable TNT was initially present only in trace amounts. Both 2,4- and 2,6-DNT were found in sections of the leached contaminated Lexington silt loam soil (Table 4.3), but only in the A horizon (the upper six inches of this soil). The vast majority of extractable 2,4- and 2,6-DNT occurred in the top two inches of the soil, and was primarily concentrated in the top inch.

FIGURE 4.1 HMX AND RDX (AVG.) CONC. IN LEXINGTON SILT LOAM SOIL LEACHATES.

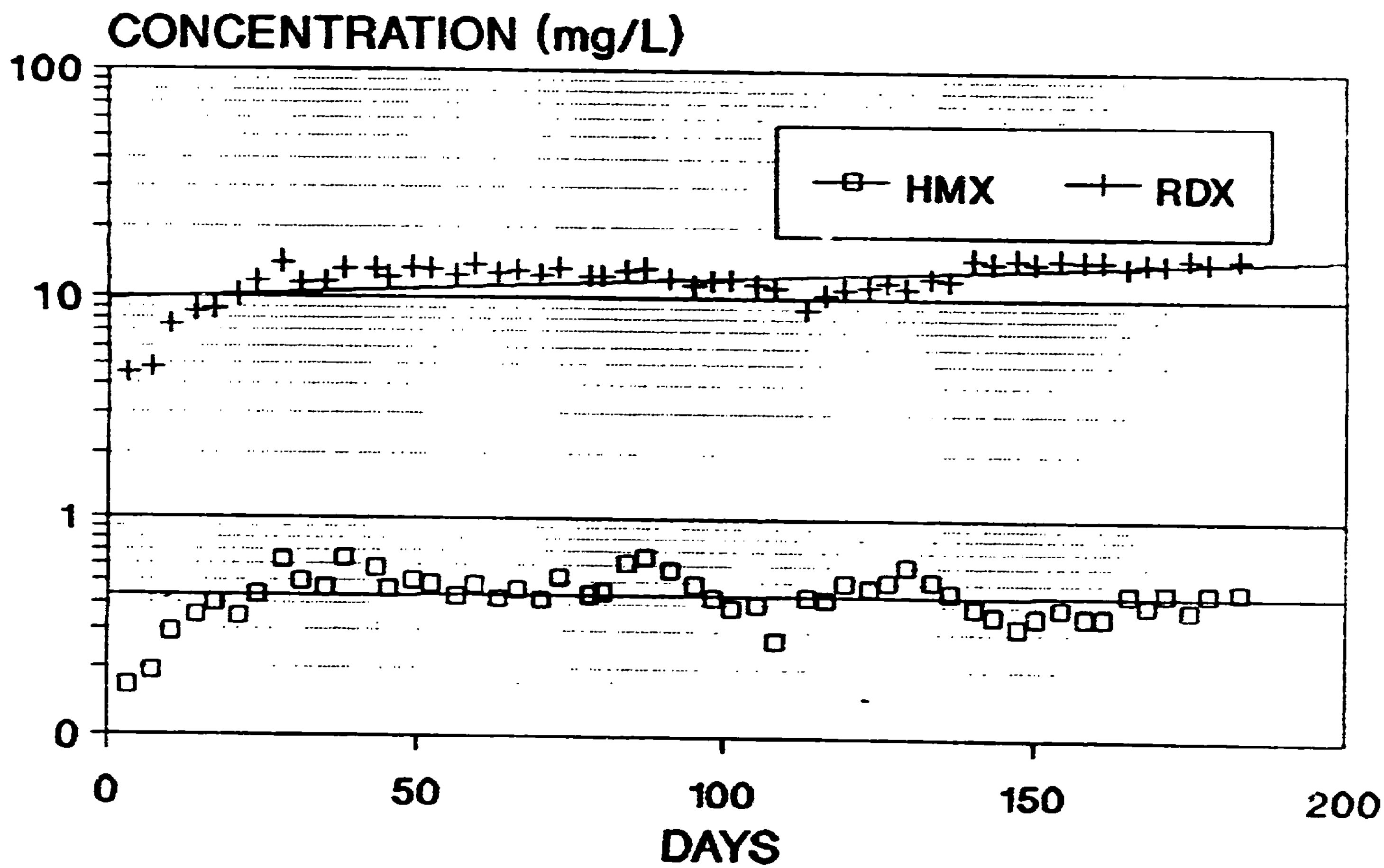


FIGURE **4.2** 2,4- & 2,6-DNT (AVG.) CONC. IN LEXINGTON SILT LOAM SOIL LEACHATES.

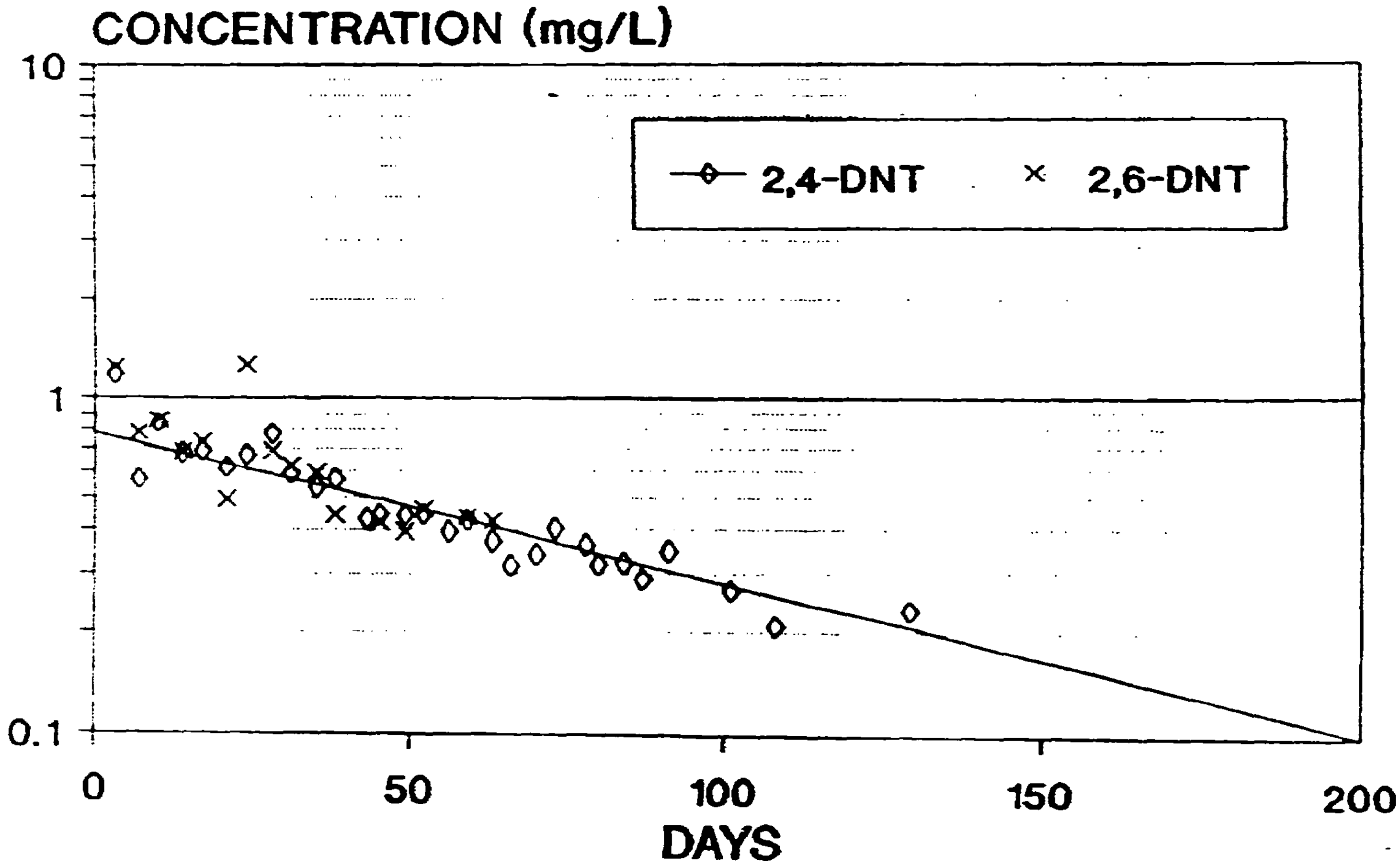


FIGURE 4.3 QUANTITIES (AVG.) OF HMX LEACHED FROM LEXINGTON SILT LOAM SOIL.

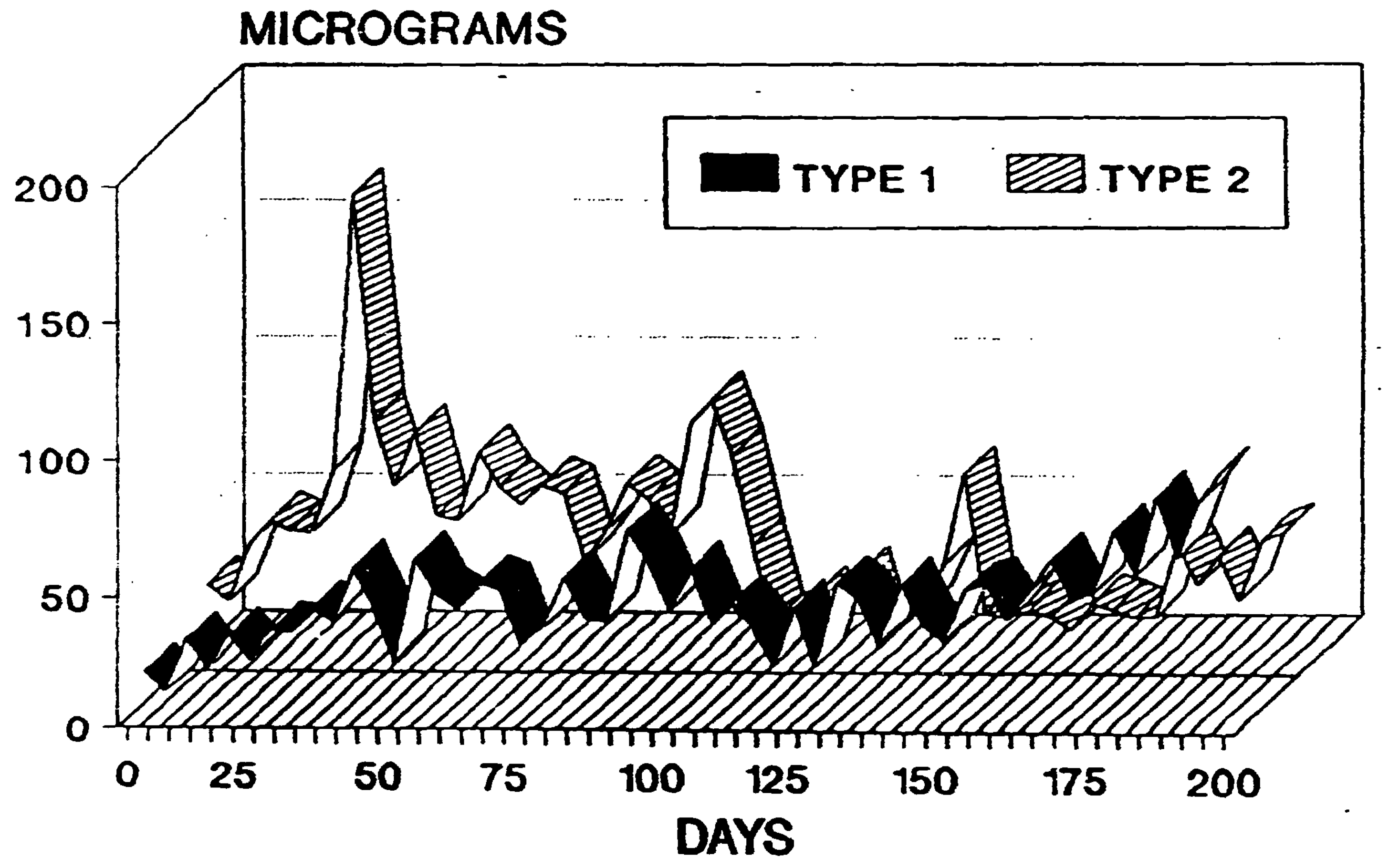


FIGURE 4.4 QUANTITIES (AVG.) OF RDX LEACHED FROM LEXINGTON SILT LOAM SOIL.

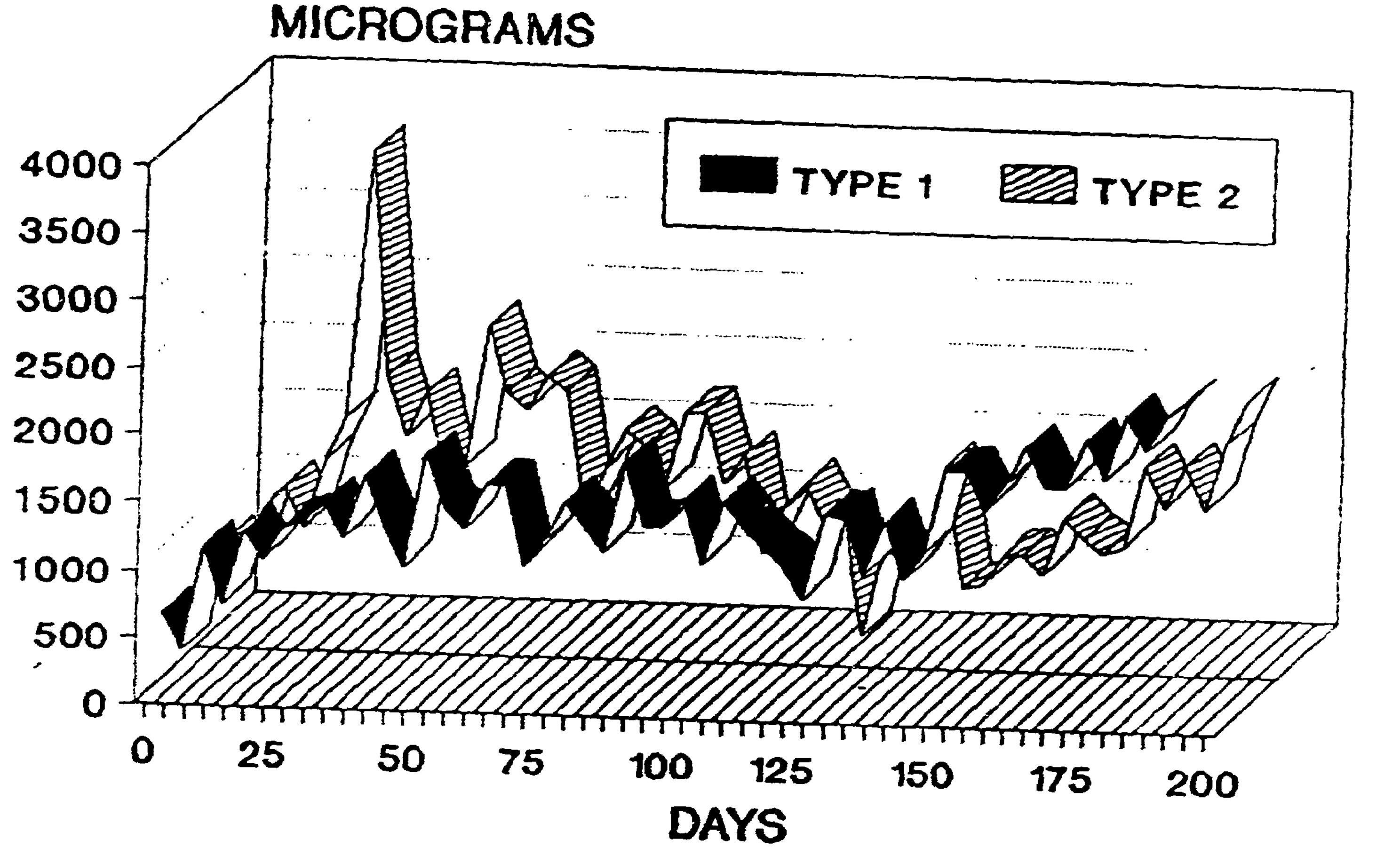


Table 4.2 Average Leachate pH Values at Each Leachate Harvest Day, for MAAP Soil-Core Columns that Received 0.7" (1.8 cm) Synthetic Rain (pH 4.60 ±0.02) Twice per Week for Up to 26 Weeks.

Days	Avg. pH	Std. Dev.	Days	Avg. pH	Std. Dev.
	11 columns			7 columns	
3	5.9	0.4	95	5.1	0.3
7	5.8	0.3	98	5.1	0.3
10	5.9	0.4	101	5.1	0.3
14	5.6	0.3	105	5.1	0.3
17	5.7	0.3	108	5.1	0.3
21	5.6	0.3	113	5.0	0.3
24	5.8	0.2	116	5.0	0.3
28	5.6	0.2	119	5.0	0.3
31	5.7	0.2	123	5.0	0.3
35	5.7	0.2	126	4.9	0.3
38	5.6	0.2	129	4.9	0.3
43	5.6	0.2	133	4.9	0.3
45	5.6	0.3	136	4.8	0.3
	9 columns			5 columns	
49	5.5	0.3	140	4.7	0.3
52	5.4	0.3	143	5.5	0.2
56	5.5	0.3	147	5.4	0.2
59	5.4	0.3	150	5.4	0.2
63	5.4	0.3	154	5.6	0.2
66	5.4	0.3	158	5.3	0.2
70	5.3	0.3	161	5.3	0.1
73	5.4	0.3	165	5.3	0.2
78	5.3	0.3	168	5.3	0.1
80	5.3	0.3	171	5.3	0.1
84	5.2	0.4	175	5.3	0.1
87	5.2	0.3	178	5.3	0.1
91	5.2	0.3	183	5.3	0.1

b. Discussion

Added into the ash/soil that made up the top inch of each column were 1000.0 mg kg^{-1} (ppm) each of RDX, HMX, and 2,4-DNT, and 400 mg kg^{-1} 2,6-DNT. When the leaching of the soil-cores commenced, RDX, HMX, 2,4-DNT, 2,6-DNT, and a trace amount of TNT were all initially present in the top inch of ash/soil atop treatment columns. No detectable transformation products were present.

After leaching of the MAAP Lexington silt loam soil-cores commenced, concentrations of both HMX and RDX in leachates tended initially to increase quickly (Fig. 4.1), then to plateau as leaching progressed. For RDX concentrations in leachates, the plateau portion of the curve tended to increase slightly over time as leaching proceeded. For HMX concentrations

in leachates, the plateau portion of the curve tended to be more erratic, making it difficult to discern whether concentrations were increasing over time. The overall trend for the plateau portion of the HMX curve was scattered about a near-constant concentration value. However, from approximately day 140 onward RDX and even HMX concentrations in leachates tended to increase as leaching progressed, coinciding with increasing mass output (quantities) of these compounds over the same time period (Fig. 4.3 and 4.4).

Although both HMX and RDX are chemically similar (both cyclic nitramines), RDX eluted in 20-fold greater amounts overall than HMX. The greater amounts of RDX leached may in large part be due to its greater solubility (42 mg kg^{-1}, 20°C) compared to HMX (6.6 mg kg^{-1}, 20°C).[31] The contour of the leaching profiles were remarkably similar (within each profile type) for both HMX and RDX (Fig. 4.1,4.3 and 4.4). In Figures 4.3 and 4.4 the type 1 mass profile that occurred in four of the eight treatmert columns yielded profiles for both HMX and RDX that contained no distict peaks. Generally, values continuously increased as leaching progressed, with a greater rate of increase from about day 140 onward. The type 2 profile, that occurred in the other half of the treatment columns for both HMX and RDX, had four recognizable peaks and as in the type 1 mass profile generally increased in value from day 140 onward. The four peaks within the type 2 profile occurred at the same positions (days) for both HMX and RDX. The first and largest mass peak for both HMX and RDX occurred at aproximately 30 days; the next peak for each was a broad peak from about 50-65 days; the third mass peak occurred at approximately 100 days for each compound; and the final peak occurred at approximately day 140. The relative magnitudes of the second and third mass peaks were reversed for HMX versus RDX, with the earlier-eluting second mass peak having greater magnitude than the third for RDX, the more soluble and faster-eluting (leaching) of the two compounds. However, a comparison of the average concentrations of HMX leaching from columns having type 1 versus type 2 mass profiles showed that each type averaged to the same value (0.43 mg L^{-1}), over 183 days (the full course of the study). Furthermore, when the same comparison was made for RDX, nearly identical values for the two types of mass profiles were also obtained, with the columns having type 1 mass profile averaging 12 mg L^{-1} over 183 days while type 2 columns averaged 13 mg L^{-1}. When two divergent mass elution profiles such as types 1 and 2 average to the same leachate concentration values (especially for each of two different compounds, HMX and RDX) it indicates that at these loading rates the same amount of each chemical was available for leaching within type 1 and type 2 columns. Furthermore, it indicates that the soil chemistry controlling the availability of the compounds (ultimately leachable) was similar, and that it is

FIGURE 4.5 HMX AND RDX (AVG.) CONC. IN LEXINGTON SILT LOAM: 6.5 WK LEACHING.

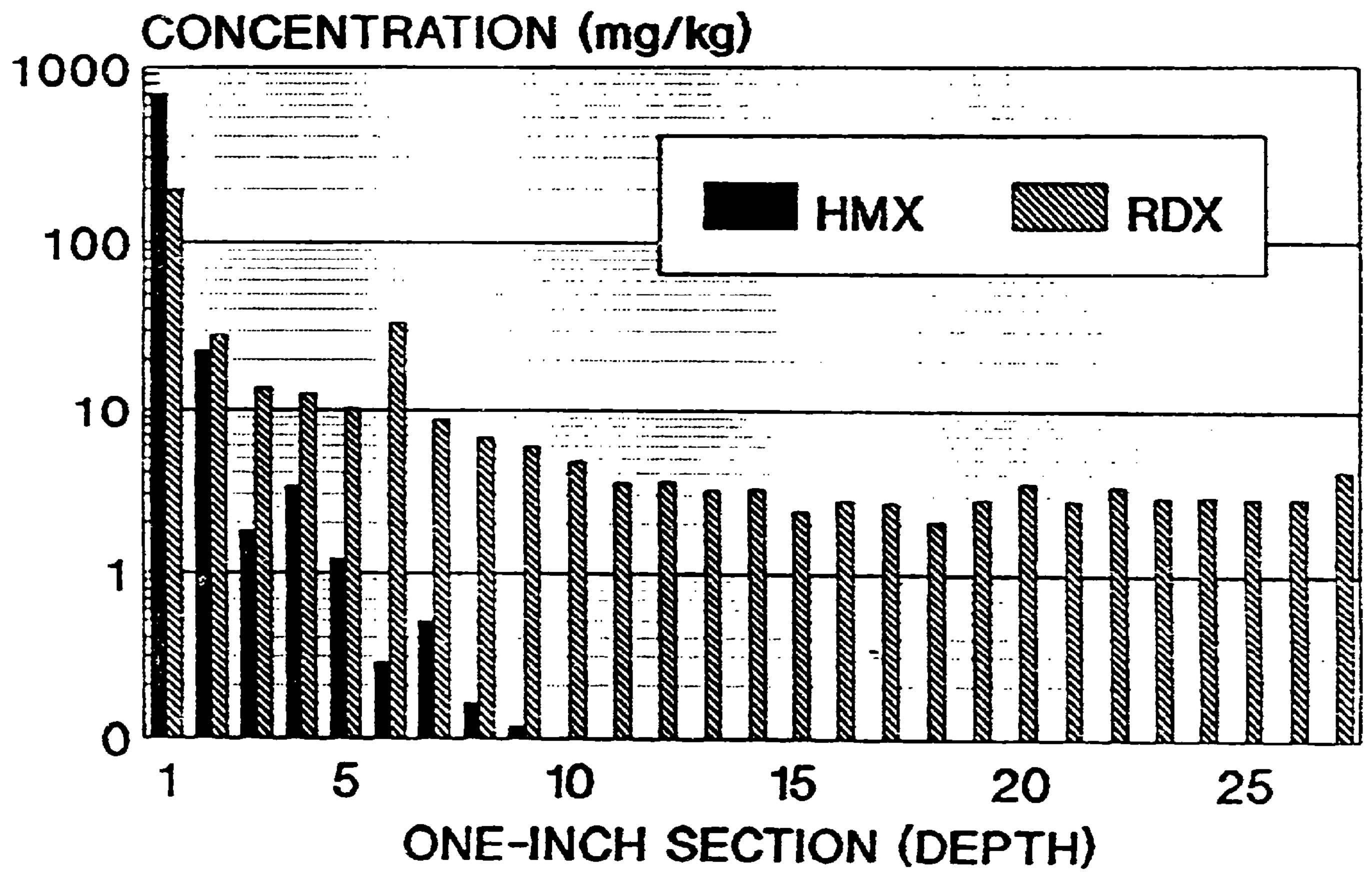


FIGURE 4.6 HMX AND RDX (AVG.) CONC. IN LEXINGTON SILT LOAM: 13 WK LEACHING.

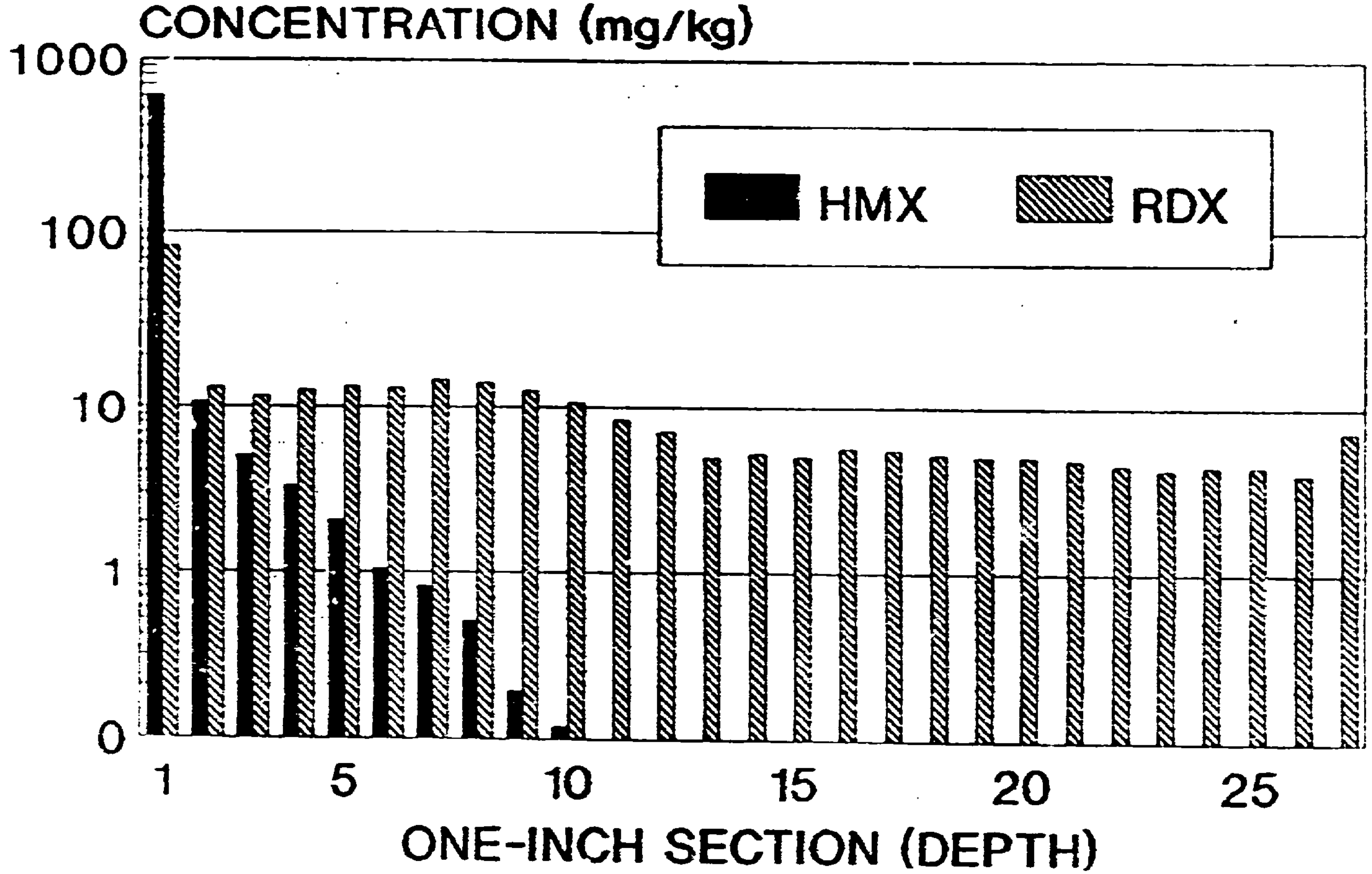


FIGURE 4.7 HMX AND RDX (AVG.) CONC. IN LEXINGTON SILT LOAM: 19.5 WK LEACHING.

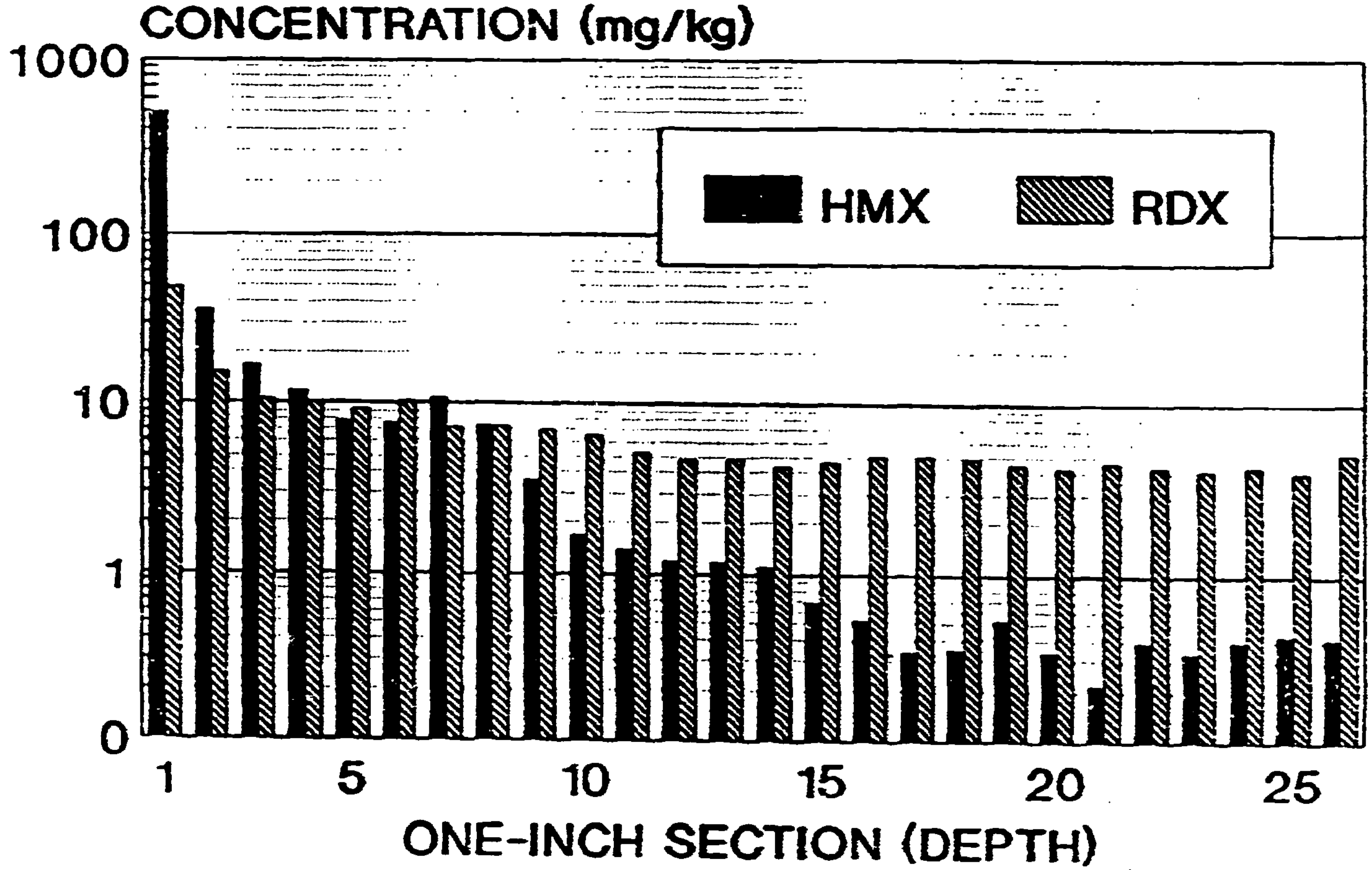


FIGURE **4.8** HMX AND RDX (AVG.) CONC. IN LEXINGTON SILT LOAM: 26 WK LEACHING.

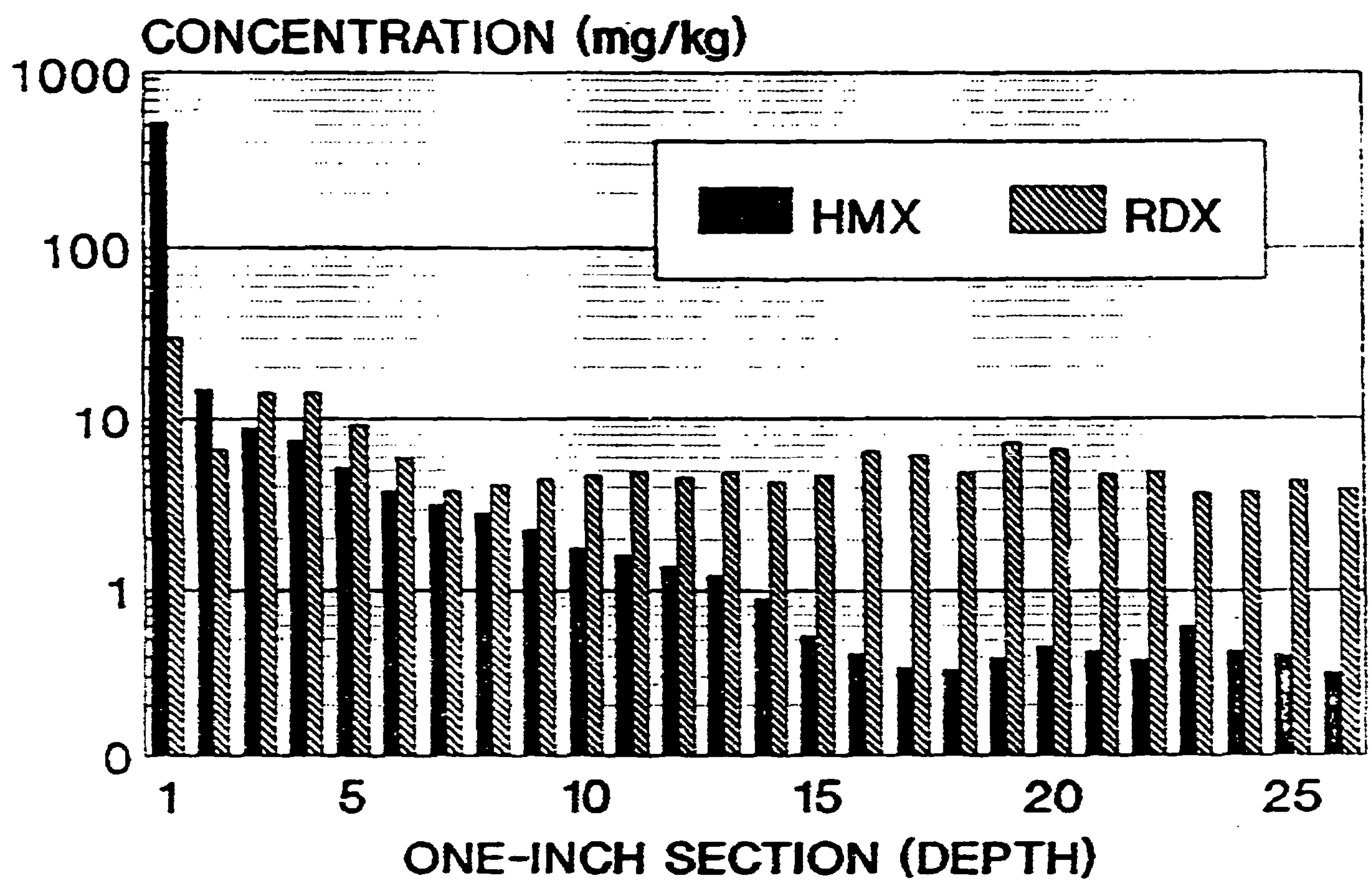


Table 4.3 Concentrations (mg/kg^{-1}) of Acetonitrile Extractable 2,4- and 2,6-DNT in 1" (2.5 cm) Duplicate Sections of Soil-Core Columns.

DEPTH	2,4-DNT	2,6-DNT
	mg kg^{-1}	
TIME ZERO (NO LEACHING)		
1"	640	250
	Below this depth:	No detectable concentrations.
6.5 WEEKS OF LEACHING		
0-1"	139	27
1-2"	12	<5.2
3-6"	<5.7	0
	Below this depth:	No detectable concentrations (0).
13 WEEKS OF LEACHING		
0-1"	134	24
1-2"	6	<5.2
3-6"	<5.7	0
	Below this depth:	No detectable concentrations (0).
19.5 WEEKS OF LEACHING		
0-1"	115	20
1-2"	13	<5.2
3-6	<5.7	0
	Below this depth:	No detectable concentrations (0).
26 WEEKS OF LEACHING		
0-1"	112	19
2-4"	<5.7	<5.2
5-6"	<5.7	0
	Below this depth:	No detectable concentrations (0).

likely that the differences in the patterns of elution (profiles) were largely physical in nature. Such differences can be explained by preferential flow of aqueous solutions within specific soils.[32] When preferential flow occurs in soils, it directly affects the rate at which chemical compounds are transported and potentially the rate at which they get to groundwater; however, preferential flow alone cannot change the total mass of a chemical that is ultimately transported through the soil.

In Figures 4.5 through 4.8 concentrations of HMX and RDX acetonitrile extractable from soil are given as a function of depth, 6.5, 13, 19.5, and 26 weeks after commencing leaching. All values measurable by HPLC analysis are reported in these figures; values are reported both above and below the respective criterion of detection from soil for HMX (2.9 mg kg^{-1}) and RDX (5.8 mg kg^{-1}), in order to best illustrate their respective patterns of transport and retention. Values above the criteria of detection are reported with a high degree of confidence; while the magnitude of those below are reported with lesser confidence, primarily to show *relative* concentrations overall. HMX, less soluble than RDX, was retained primarily in the top 1" (0-2.5 cm) of soil and in greater proportions than RDX. However as leaching progressed HMX was found at progressively greater depths within the Lexington silt loam soil, but the concentrations of extractable HMX retained in the top 1" (0-2.5 cm) of soil declined only slightly. RDX was transported through the soil so quickly that it was found at all depths at the first soil sampling period, 6.5 weeks after leaching commenced. Furthermore, the amounts of RDX extractable from the top 1" (0-2.5 cm) of soil continued declining as leaching progressed, yet concentrations of extractable RDX at greater depths increased only slightly. It is interesting to note that the soil sampling period that indicates HMX was transported the full length of the column (breakthrough; Fig. 4.7, 19.5 weeks) coincides with the leaching period where concentrations of HMX and RDX in leachates progressively increased (days 140-150 onward).

HMX and RDX recovered in leachates and from soil are given in Table 4.4, for the contaminated soils leached 6.5 weeks. Recovery of HMX in leachates was a small percentage of the total. However, with aqueous solubility six to seven times as great as HMX (20°C), the recovery of RDX in leachates accounted for 12% of that added to the ash/soil spike. Virtually all of the recoverable HMX came from the soil, and total recovery of HMX was high. The recovery of RDX from soil was less than that for HMX, yet represented more than half of that added. Overall, the recovery of HMX was high (88%), and that for RDX was quite good (70%). But over time, the amount of RDX recoverable from soil declined with additional leaching, migration, and perhaps degradation. After 26 weeks of leaching, the recovery of

HMX was essentially unchanged but the recovery of RDX declined to 24% from soil, and 36% overall.

Unlike HMX and RDX, 2,4- and 2,6-DNT concentrations in leachates declined as leaching progressed (Fig. 4.2). The best-fit line is shown for 2,4-DNT data which had a greater number of data points than 2,6-DNT, in part because 2,4-DNT had a lower criterion of detection value than 2,6-DNT (<1.8 vs. <3.5 mg L^{-1}); however, the 2,6-DNT values are also distributed about this same line. Extractable 2,4- and 2,6-DNT were both found in sections of the leached contaminated Lexington silt loam soil (Table 4.3) but only in the A horizon, the upper 6" (0-15 cm) of this soil. This soil had the capacity to strongly bind nitroaromatics, as indicated by the fixation of 36-38% of the 2,4- and

Table 4.4 HMX and RDX Recovered (Avg. of Duplicates) in Leachates and Soil*, 6.5 Weeks After Commencing Leaching.

	HMX	RDX
Amount added in spike (mg)	160	160
Recovered in leachate (mg)	1.0	19.4
Percent of added spike	0.6%	12%
Recovered in soil (mg)	139	93.1
Percent of added spike	87%	58%
Total recovered (mg)	140	112
Percent of added spike	88%	70%

* Intact soil-core columns of Lexington silt loam soil from MAAP.

2,6-DNT during preparation of the ash/soil spike [mg kg^{-1}: 2,4-DNT $1000_{\text{added as spike}} - 640_{\text{extractable spike}} = 360_{\text{fixed}}$; 2,6-DNT $400_{\text{added as spike}} - 250_{\text{extractable spike}} = 150_{\text{fixed}}$]. Following leaching and simulated weathering (wetting/drying cycles) the majority of extractable 2,4- and 2,6-DNT occurred in the top 2" (0-5 cm) of the soil, primarily concentrated in the top 1" (0-2.5 cm), with the amounts of 2,4- and 2,6-DNT fixed increasing to 85% for 2,4- and 89% for 2,6-DNT after only 6.5 weeks of leaching. Fixation continued between 6.5 and 26 weeks of leaching with the amounts of 2,4- and 2,6-DNT fixed increasing, but not as precipitously, to 89% 2,4-DNT and 92% 2,6-DNT.

5. CONCLUSIONS

* **Intact Soil Column System: CESMU**

A state-of-the-art controlled environment soil-core microcosm unit (CESMU) system was developed to determine the transport and transformation of chemicals in MAAP soil. The system used intact soil-core columns from the MAAP OB/OD site. The major improvement of the CESMU system over existing microcosm technology was incorporation of a controlled weak vacuum to cause a continuous tension on the soil-core columns. This allowed study of chemical transport and transformation under laboratory conditions.

* **Explosives and Transformation Products in Leachates and Soil**

RDX and HMX in MAAP soil leachates were measurable throughout this study, averaging 0.4 and 12 mg L^{-1} (ppm) respectively. Both 2,4- and 2,6-DNT in leachates tended to decrease over time, averaging 0.63 and 0.67 ppm respectively from commencement of leaching through day 58. TNT in leachates was initially low, and after day 10 there were no quantifiable concentrations of TNT ($\leq$0.09 ppm).

RDX was so mobile that it was found in soil throughout the soil-core by 6.5 weeks, while HMX was found at progressively greater depths to 19.5 weeks when it too was found in soil throughout the soil-core. Both 2,4- and 2,6-DNT were found only in the A horizon (top 6") soil. The vast majority of extractable 2,4- and 2,6-DNT occurred in the top two inches of the soil, and was primarily concentrated in the top inch.

No transformation products of HMX, RDX, 2,4-DNT, 2,6-DNT, or TNT were detected in any of the leachates, or in the MAAP Lexington silt loam soil.

* **Anthropogenic Elevation of Metal Levels in Soil**

Concentrations of all metals studied were higher in the contaminated ash/soil than the uncontaminated Lexington silt loam soil. Relative concentrations of metals in contaminated ash/soil expressed as percentages of the values from uncontaminated background soil, and determined concentration values (mg kg^{-1}) for the contaminated ash/soil, were: Cd 1600% (9.0), Cr 760% (47), Cu 9900% (928), Pb 5600% (534), and Zn 5200% (2496). On the basis of the anthropogenic elevations alone, the greatest potential environmental hazard from metallic residues at MAAP appear to be due to the elevated Cu, Pb, and Zn concentrations in OB/OD contaminated soil.

Literature Cited

(1) Layton D.W., T.E. McKone, C.H. Hall, M.A. Nelson and Y.E. Ricker. 1986. UCRL-15902 (AD-A182922); Lawrence Livermore National Laboratory, Livermore, CA.

(2) AEHA Correspondence, HSHB-ES-H, 19 May 86, Subject: Toxicity of Soils and Residues Contaminated with Explosives and Heavy Metals; U.S. Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD.

(3) AEHA. 1986. Hazardous Waste Study #37-26-0593-86. U.S. Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD.

(4) Walsh, M.E. 1990. Special Report 90-2 CRREL (AD-A220610); U.S. Army Corps of Engineers; Cold Regions Research and Engineering Laboratory; Hanover, NH.

(5) Cataldo, D.A., S.D. Harvey, R. J. Fellows, R.M. Bean, and B.D. McVeety. 1989. PNL Report 7370/UC-402 (AD-A2235'46); Pacific Northwest Laboratory; U.S. Army Medical Research and Development Command; Ft. Detrick, MD.

(6) Cataldo, D.A., S.D. Harvey, R. J. Fellows. 1990. PNL Report 7529/UC-402 (AD-A229646); Pacific Northwest Laboratory; U.S. Army Medical Research and Development Command; Ft. Detrick, MD.

(7) Phillips, C.T., R.T. Checkai, R.S. Wentsel. Toxicity of Selected Munitions and Munition-Contaminated Soil on the Earthworm (Eisenia Foetida); Technical Report ERDEC-TR-037, April 1993.

(8) Haley, M.V., R.T. Checkai, C.W. Kurnas, R.O. Nwanguma, M.C. Sadusky, and R.S. Wentsel. Toxicity Determination of Explosive Contaminated Soil Leachates to Daphnia Magna Using an Adapted Toxicity Characteristic Leaching Procedure; Technical Report CBDA-TR-030, June 1993 (In Press).

(9) Esser, H.O., R.J. Hemingway, W. Klein, D.B. Sharp, J.W. Vonk, and P.T. Holland. 1988. IUPAC Reports on Pesticides (24): Recommended approach to the evaluation of the environmental behavior of pesticides. Pure & Appl. Chem. 60:901-932.

(10) Cabrera, M.L. and D.E. Kissel. 1988. Evaluation of a method to predict nitrogen mineralized from soil organic matter under field conditions. Soil Sci. Soc. Am. J. 52:1027-1031.

(11) Van Voris, P., M.F. Arthur and D.A. Tolle. 1982. Evaluation of terrestrial microcosms for assessing ecological effects of utility wastes. EPRI EA-2364. Electric Power Research Institute, Palo Alto, CA.

(12) Zwick, T.C., M.F. Arthur, D.A. Tolle and P. Van Voris. 1984. A unique laboratory method for evaluating agro-ecosystem effects of an industrial waste product. Plant and Soil 77:395-399.

(13) U.S. Environmental Protection Agency. 1987. Soil-core microcosm test. Fed. Reg. 52:36363-36371.

(14) American Society for Testing and Materials. 1990. Standard guide for conducting a terrestrial soil-core microcosm test. Designation E 1197-87. Annual Book of ASTM Standards, Vol. 11.04. American Society for Testing and Materials, Philadelphia, PA. pp. 775-778.

(15) Checkai, R.T., R.S. Wentsel, C.T. Phillips, and R.L. Yon. 1993. U.S. Army ERDEC Technical Report (in press): Controlled Environment Soil Core Microcosm Unit (CESMU) For Investigating Fate, Transport, and Transformation of Chemicals in Site-Specific Soils; U.S. Army Edgewood Research Development and Engineering Center; Aberdeen Proving Ground, MD.

(16) Lemley, A.T., R.J. Wagenet and W.Z. Zhong. 1988. Sorption and degradation of Aldicarb and its oxidation products in a soil-water flow system as a function of pH and temperature. J. Environ. Qual. 17:408-414.

(17) Palazzo, A.J., R. Bailey and J. Graham. 1988. Effects of temperature and species on TNT injury to plants. Special Report 88-16. U.S. Army Corps of Engineers, CRREL, Hanover, NH.

(18) U.S. Soil Conservation Service. 1984. Soil Survey of Carroll County, Tennessee. U.S. Department of Agriculture, Washington, DC.

(19) U.S. Environmental Protection Agency. 1979. The soil core microcosm - a potential screening tool. EPA-600/3-79-089. Corvallis, OR.

(20) Rogers, J.S. and C.E. Carter. 1987. Soil core sampling for hydraulic conductivity and bulk density. Soil Sci. Soc. Am. J. 51:1393-1394.

(21) Arny, C.J. and E.J. Pell. 1986. Ethylene production by potato, radish, and soybean leaf tissue treated with simulated acid rain. Envir. Exp. Bot. 26:9-15.

(22) Lebowitz, L. 1983. Statistical analysis of MAP3S precipitation chemistry data, 1977-1981. M.S. Thesis. The Pennsylvania State University, State College, PA.

(23) Likens, G.F., F.H. Bormann and N.M. Johnson. 1972. Acid Rain. Environment 14:33-44.

(24) Jenkins T.F. and M.E. Walsh. 1987. CRREL Report 87-7 (AD-A183738); U.S. Army Corps of Engineers; Cold Regions Research and Engineering Laboratory; Hanover, NH.

(25) Jenkins T.F., P.W. Schumacher, M.E. Walsh and C.F. Bauer. 1988. CRREL Report 88-8 (AD-A213045); U.S. Army Corps of Engineers; Cold Regions Research and Engineering Laboratory; Hanover, NH.

(26) Bauer C.F., T.F. Jenkins, S.M. Koza, P.W. Schumacher, P.H. Miyares and M.E. Walsh. 1989. CRREL Report 89-9 (AD-A213000); U.S. Army Corps of Engineers; Cold Regions Research and Engineering Laboratory; Hanover, NH.

(27) Miyares P.H. and T.F. Jenkins. 1990. CRREL Special Report 90-30; U.S. Army Corps of Engineers; Cold Regions Research and Engineering Laboratory; Hanover, NH.

(28) USATHAMA Quality Assurance Program. 1990. USATHAMA PAM 11-41 (Rev. No. 0); U.S. Army Toxic and Hazardous Materials Agency; Aberdeen Proving Ground, MD.

(29) Hubaux A. and G. Vos. 1970. Decision and detection limits for linear calibration curves. Anal. Chem. 42(8): 849-855.

(30) Layton, D., B. Mallon, W. Mitchell, L. Hall, R. Fish, L. Perry, G. Snyder, K. Bogen, W. Malloch, C. Ham, and P. Dowd. 1987. Conventional Weapons Demilitarization: a Health and Environmental Effects Data Base Assessment. In Explosives and their Co-Contaminants Final Report, Phase II. UCRL-21109

(AD-A220588); Lawrence Livermore National Laboratory; Livermore, CA.

(31) Tucker, W.A., E.V. Dose, G.J. Gensheimer, R.E. Hall, C. D. Pollman, and D. H. Powell. 1985. Evaluation critical parameters affecting contaminant migration through soils, Vol. 1. AMXTH-TE-TR-85030 (AD-B097476L); Environmental Science and Engineering; Gainesville, FL.

(32) Ghodrati, M. and W.A. Jury. 1990. A field study using dyes to characterize preferential flow of water. Soil Sci. Soc. Am. J. 54:1558-1563.

APPENDIX A

QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

a. Analytical chemistry.

I. Analytical standards of explosives and related compounds were prepared by purification of existing USABRDL standards. Purification was accomplished by recrystallization in a water acetone system. A mixture of HMX, TNB, RDX, TNT, 2,6DNT, 2,4DNT, 2-Amino DNT, and 4-Amino DNT was prepared from analytical standards with each component at 100 ppm in acetonitrile. This mixture was sealed and stored at 2 to 5 degrees centigrade and used until expended (about six weeks).

II. The mixture was serially diluted with water or acetonitrile in a ten step process to yield calibration standards of 10, 5, 2.5, 1.25, 0.63, 0.32, 0.16, 0.08, 0.04, and 0.02 ppm. The standards were analyzed, peak areas recorded and a plot of concentrations/peak areas produced. Linear regression of this data in the form of $Y = MX + B$ with concentration as the dependent variable were calculated. This equation was used to calculate unknown concentrations from analyzed peak areas. New calibration standards were analyzed with each set of analytes run and the calibration curve recalculated.

III. Control samples to be analyzed with the test samples were prepared by diluting the multipart standard to 2.5 ppm with acetonitrile. Control samples were prepared in triplicate and analyzed with each batch of samples. The mean and standard deviation of these analyses were calculated and results from each analytical run plotted as scattergrams (Figures A1 to A9).

b. Extracts.

I. Soil columns were sectioned and soils ground and extracted in accordance with SOP and all extracts analyzed in triplicate. Quality assurance procedures were established to ascertain the efficiency of the extraction process. Uncontaminated soil samples were spiked after grinding with a mixture of the compounds under study and a percent recovery performed for each site (Table A1). Spiked samples were prepared in triplicate and analyzed with each batch of 27 soil extracts.

II. Dinitrobenzene (DNB) was added to the acetonitrile soil extraction solution as a means to provide an internal recovery standard for each soil sample analyzed. Separate samples containing only DNB and acetonitrile were analyzed in triplicate with each batch of soil extracts. Mean recovery and standard deviation of these samples were calculated as a check on extraction losses and analytical imprecision. These results are presented in Figure A10.

c. Leachates.

Aqueous leachates were collected within the CESMU and removed for analysis. Samples were then refrigerated until analyzed. Leachates were not concentrated and recoveries were not corrected by internal standardization.

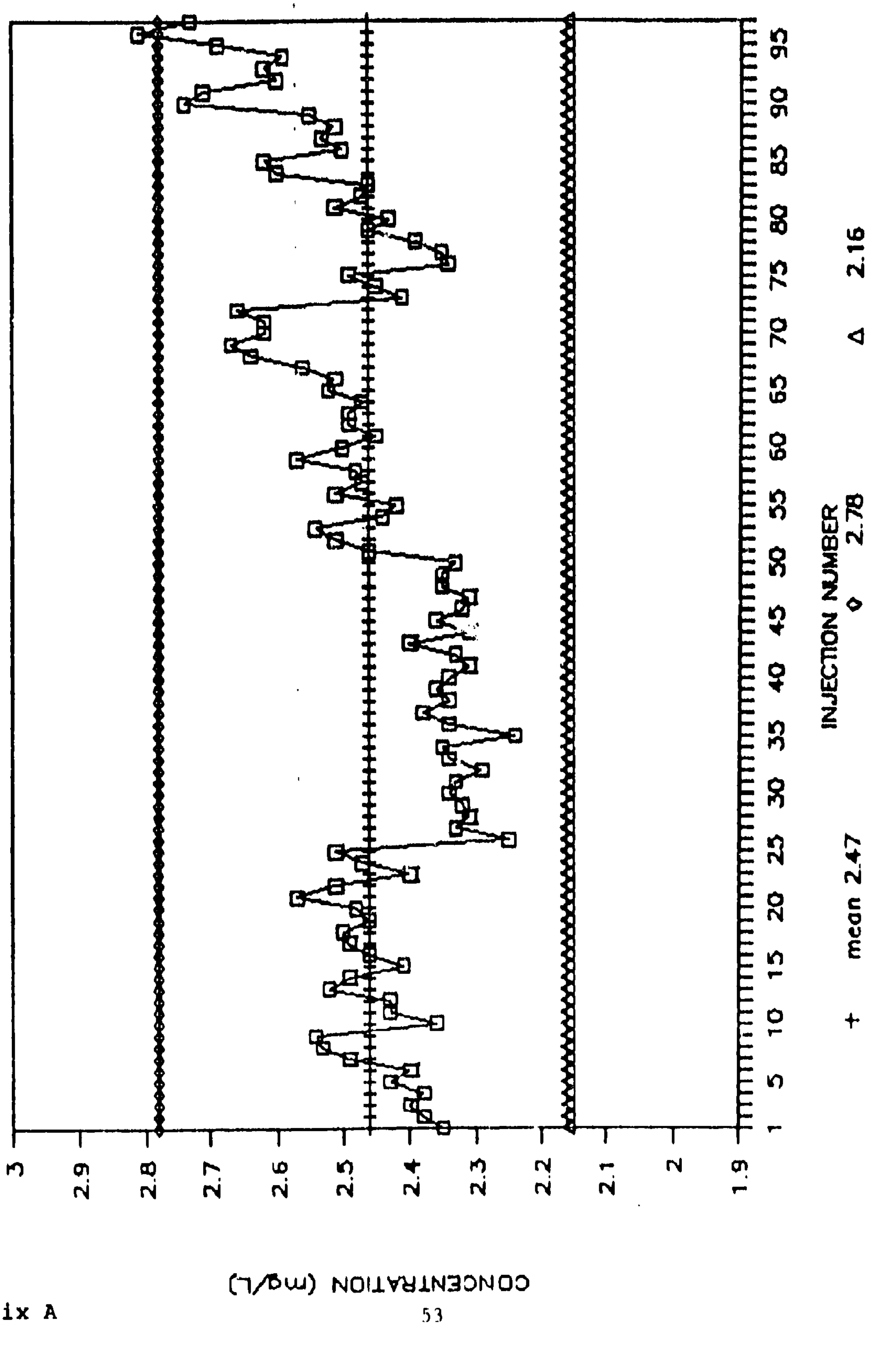
d. Measuring devices.

Soils and explosives were weighed on scales of certified accuracy. Pipets were checked for accuracy when placed in service. Volumetric glassware was of certified accuracy.

e. Quality Assurance Categories for Investigation.

This investigation was initiated prior to the Toxicology Division SOP MGT-1 of 1 Oct. 91. However, this work meets the criteria of "Exploratory Research" in nature and is therefore classified as a Category 1 investigation. Good Laboratory Practices as applicable to this category of investigation, which were in place at the onset of work (Jan 1989), were followed throughout.

Fig. A1
HMX VARIABILITY IN THE MTPS



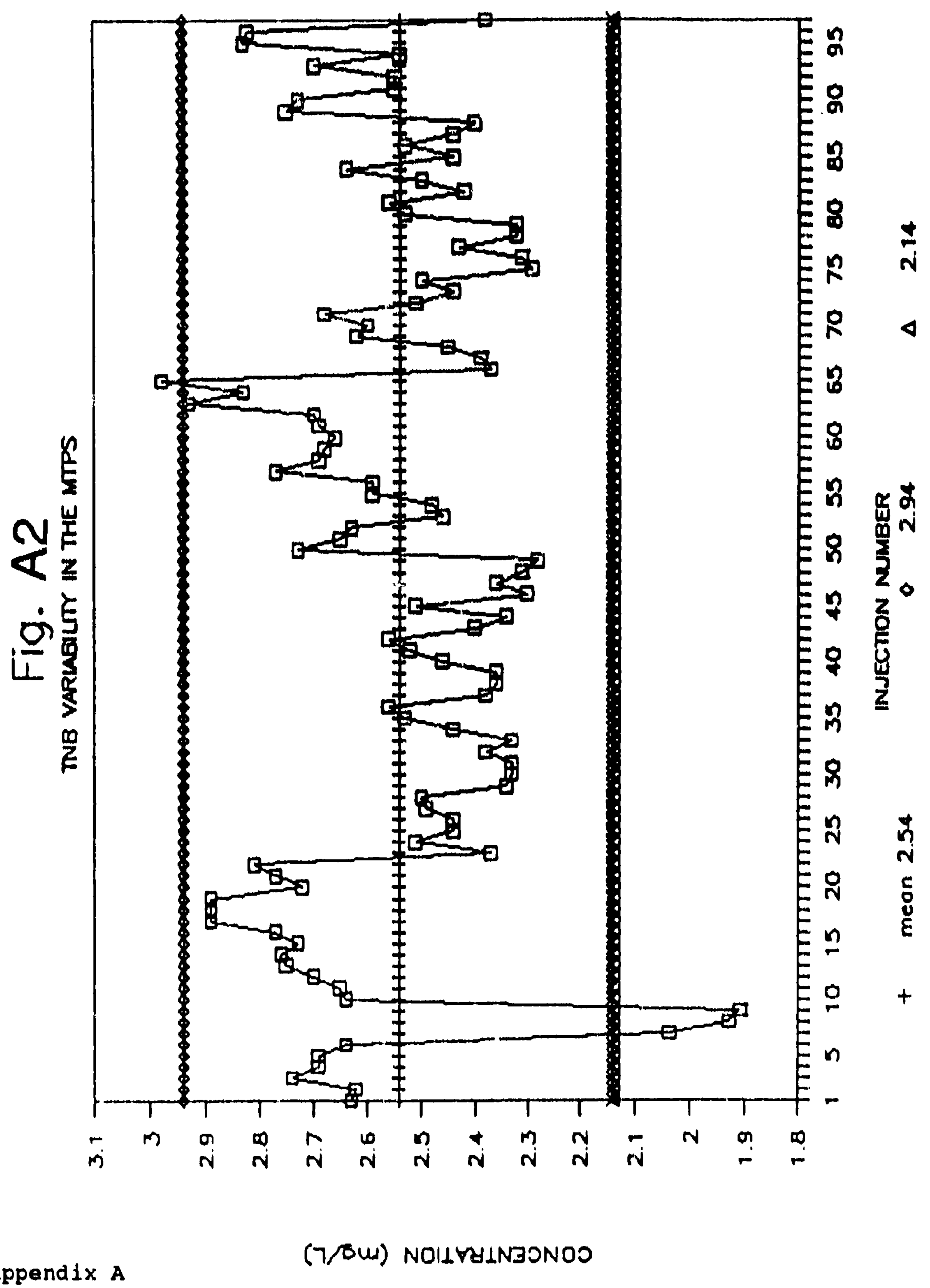
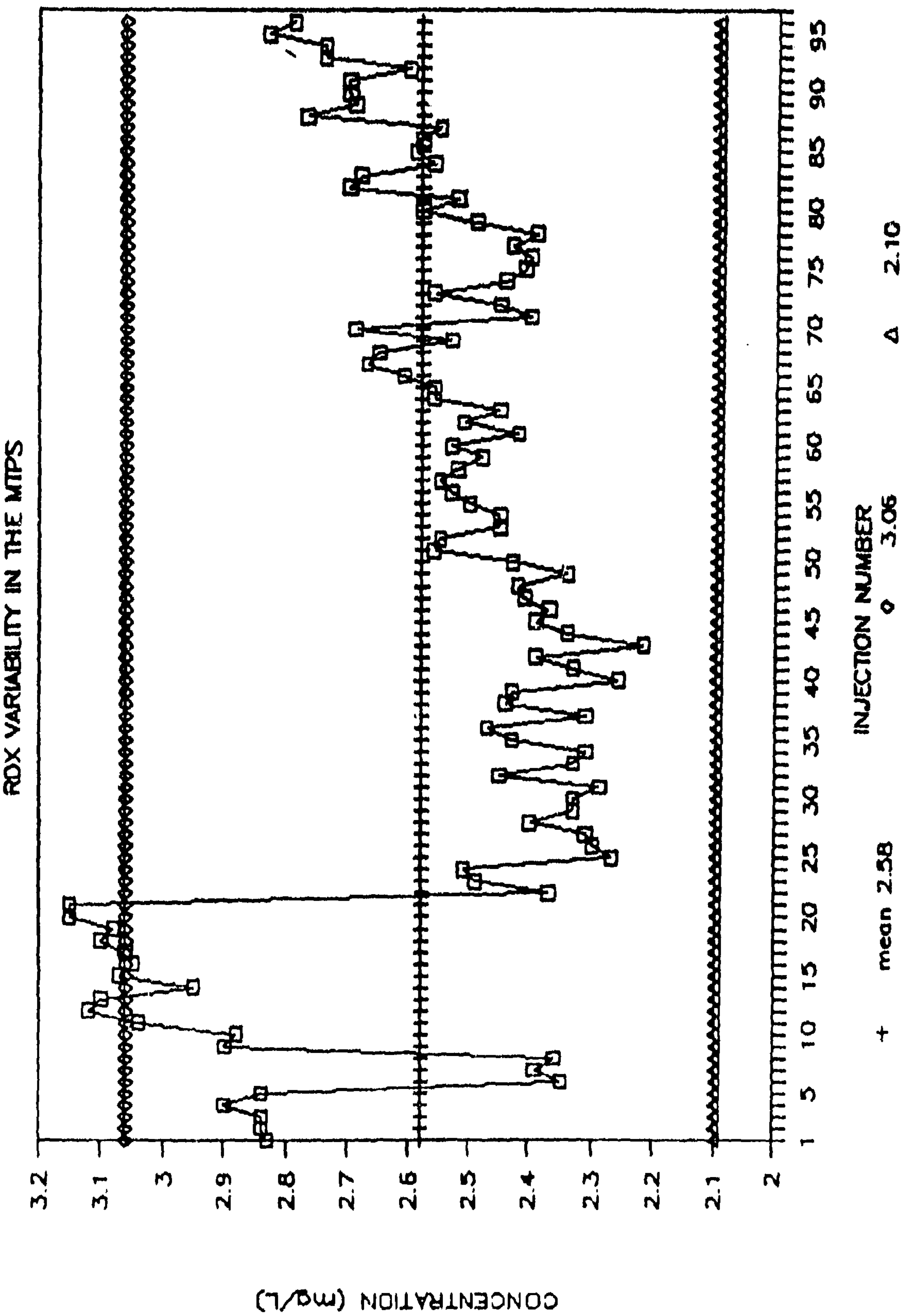


Fig. A2
TNB VARIABILITY IN THE MTPS
CONCENTRATION (mg/L)
3.1
3
2.9
2.8
2.7
2.6
2.5
2.4
2.3
2.2
2.1
2
1.9
1.8
1 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95
INJECTION NUMBER
+ mean 2.54
◇ 2.94
Δ 2.14

Appendix A

Fig. A3

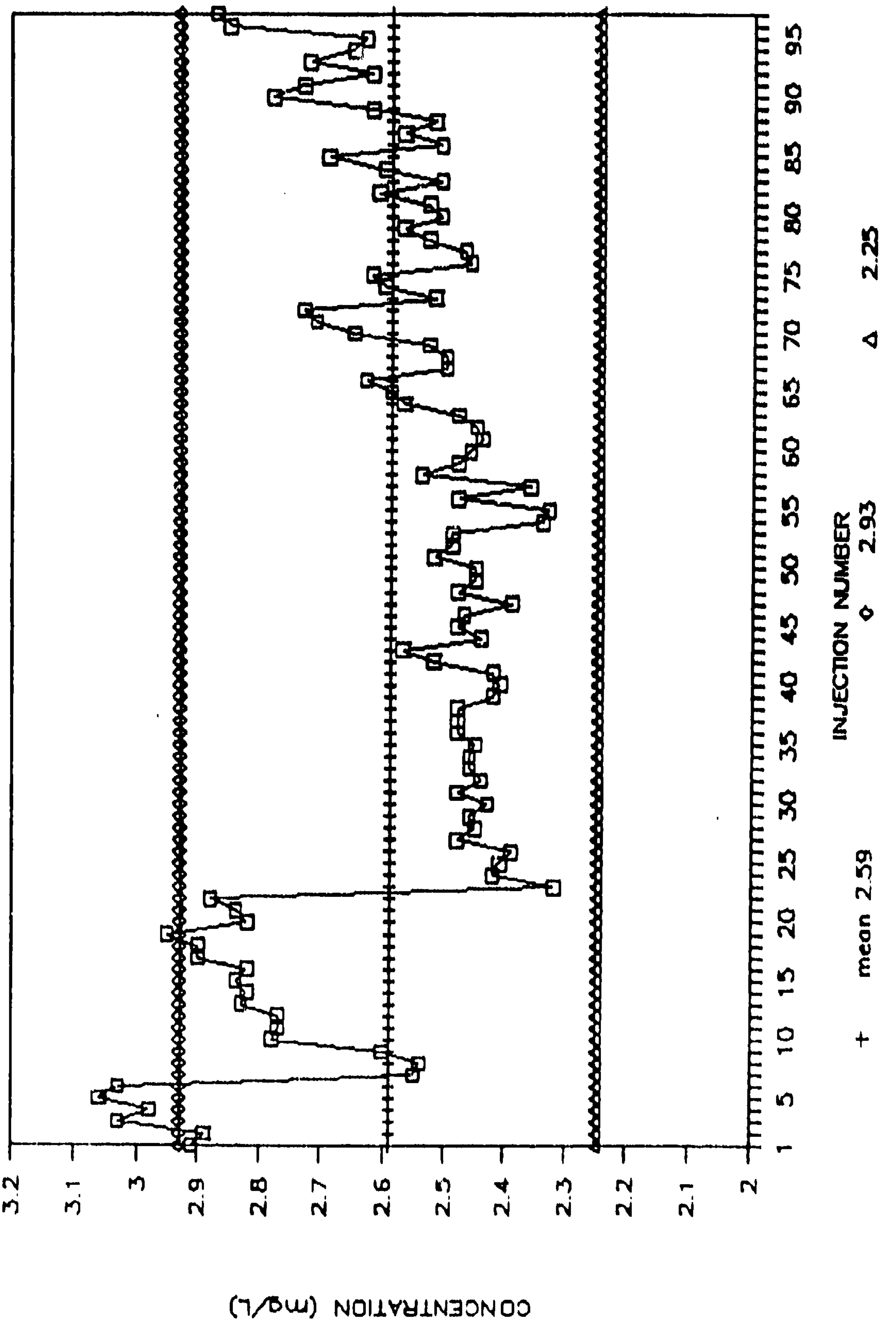
RDX VARIABILITY IN THE MTPS



Appendix A

Fig. A4

TNT VARIABILITY IN THE MTPS



Appendix A

Fig. A5

2,4 DNT VARIABILITY IN THE MTPS

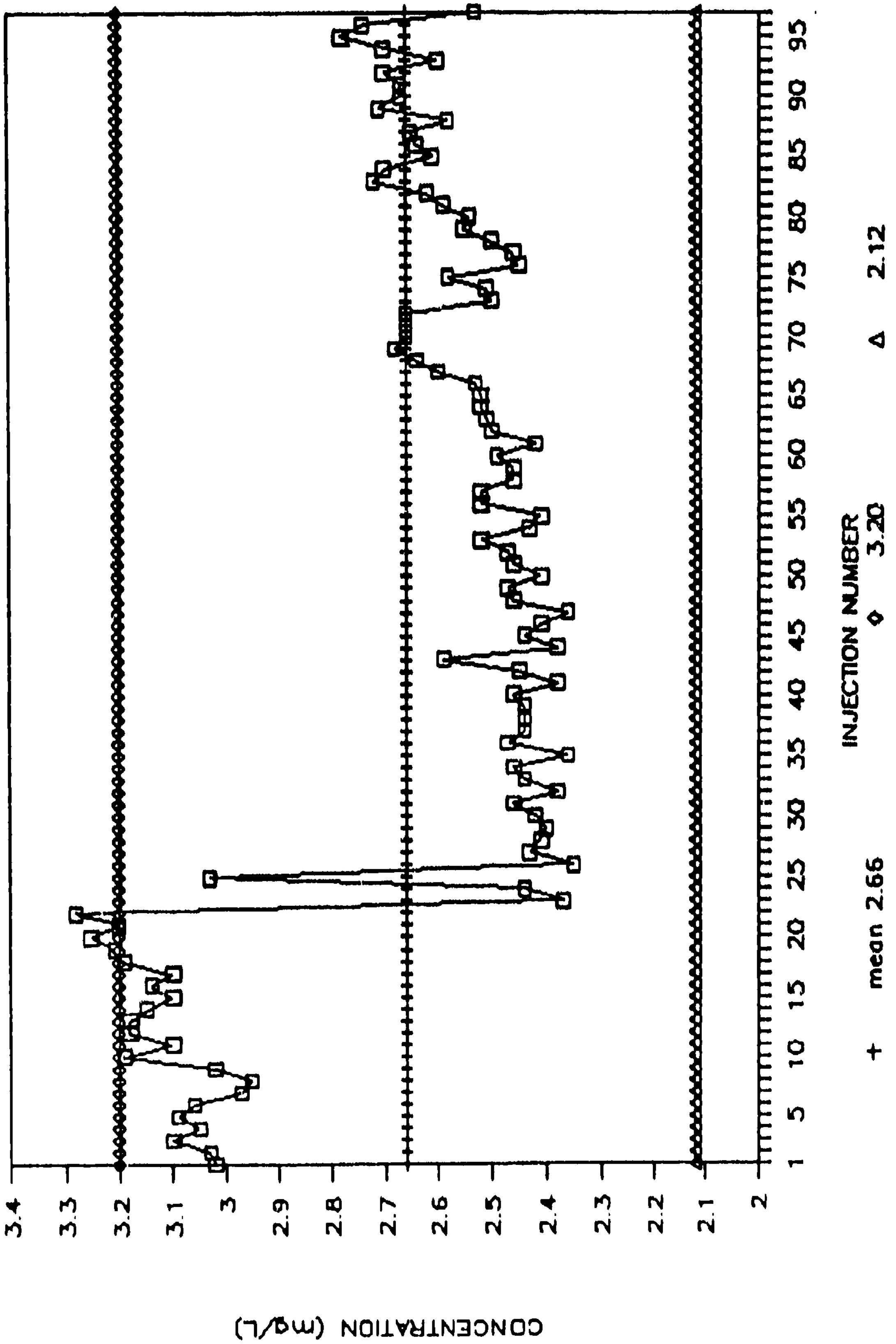


Fig. A6

2,6 DNT VARIABILITY IN THE MTPS

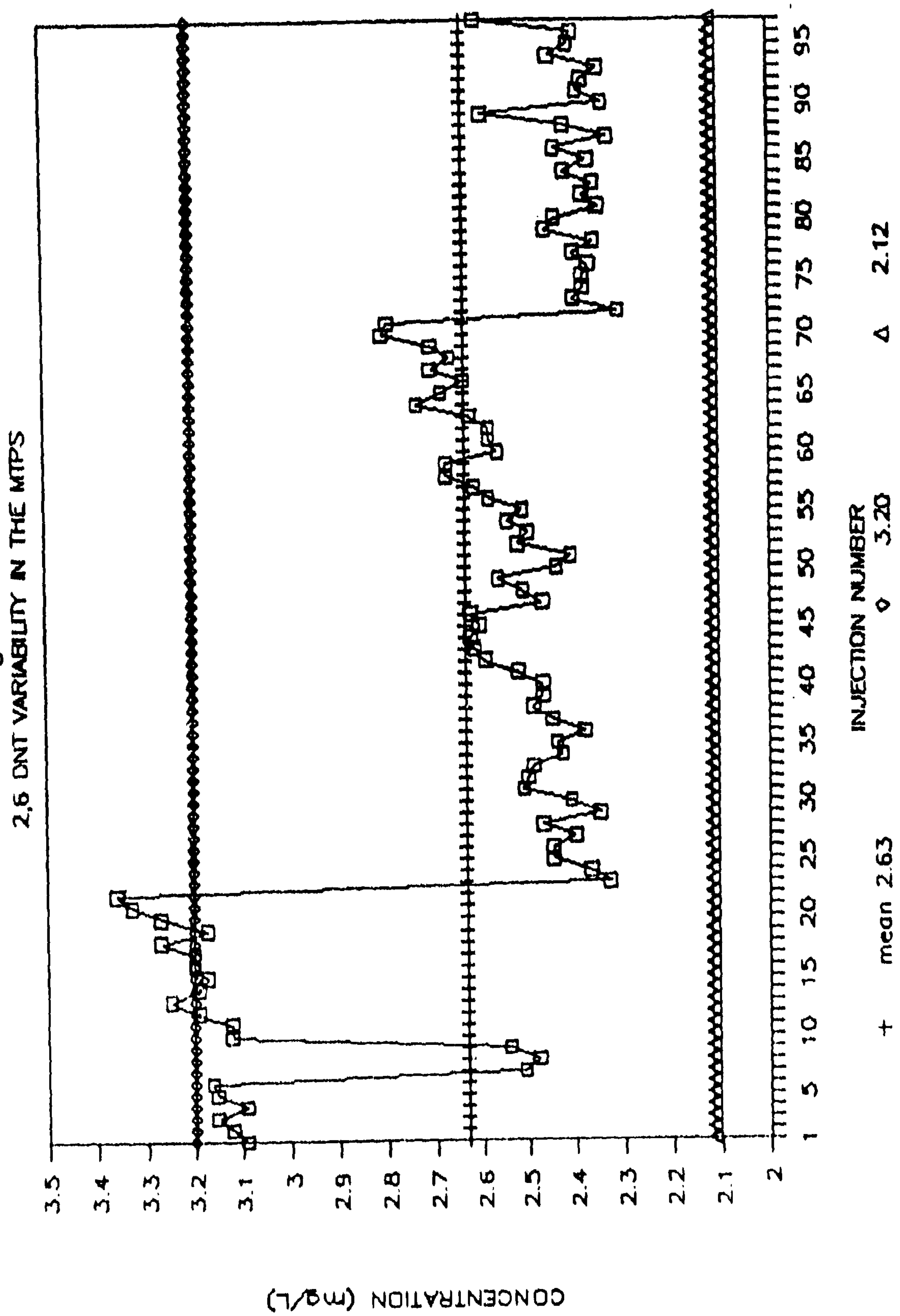


Fig. A7

2-AMINO 4,6 DNT VARIABILITY IN THE MTPS

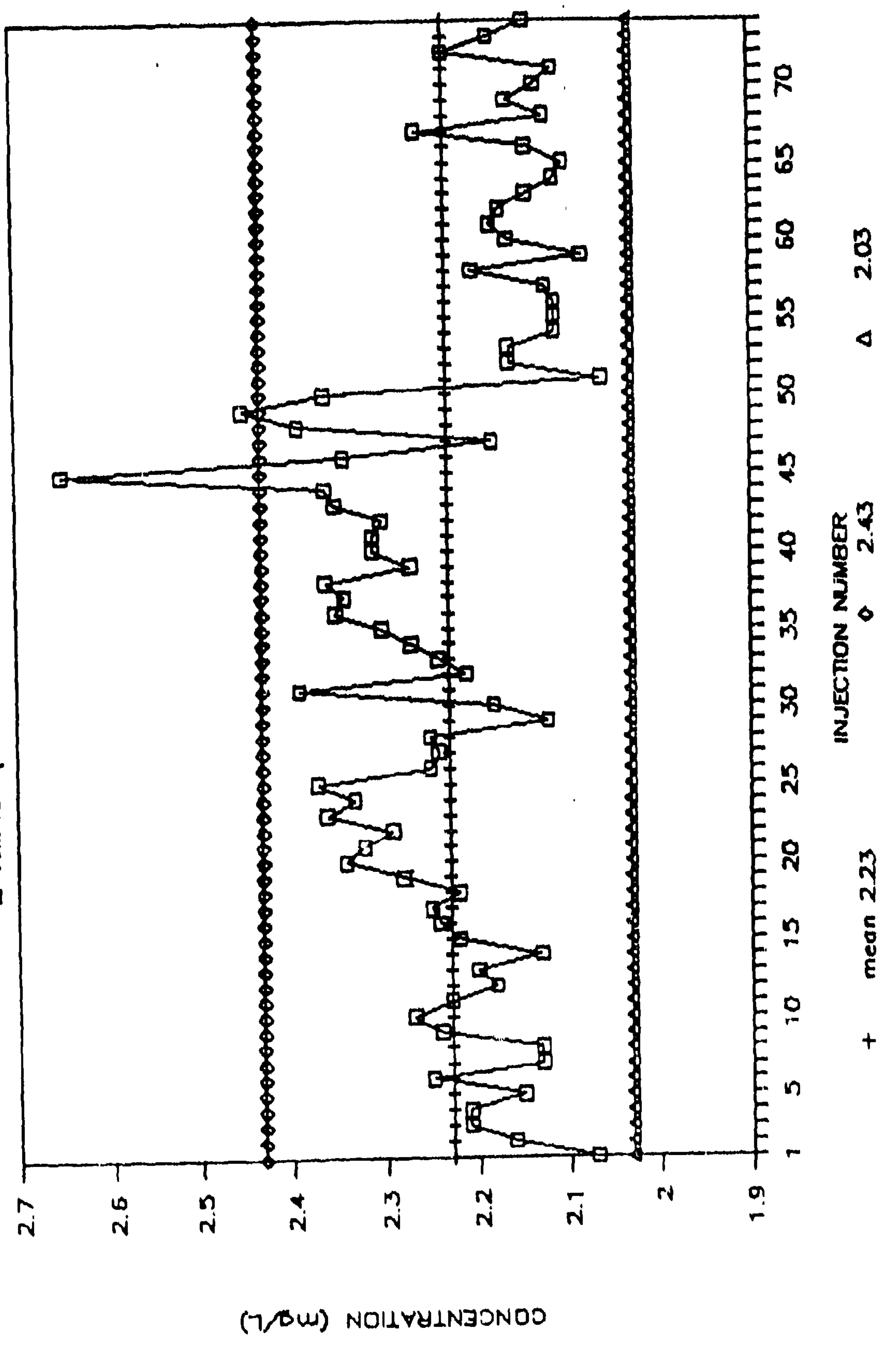
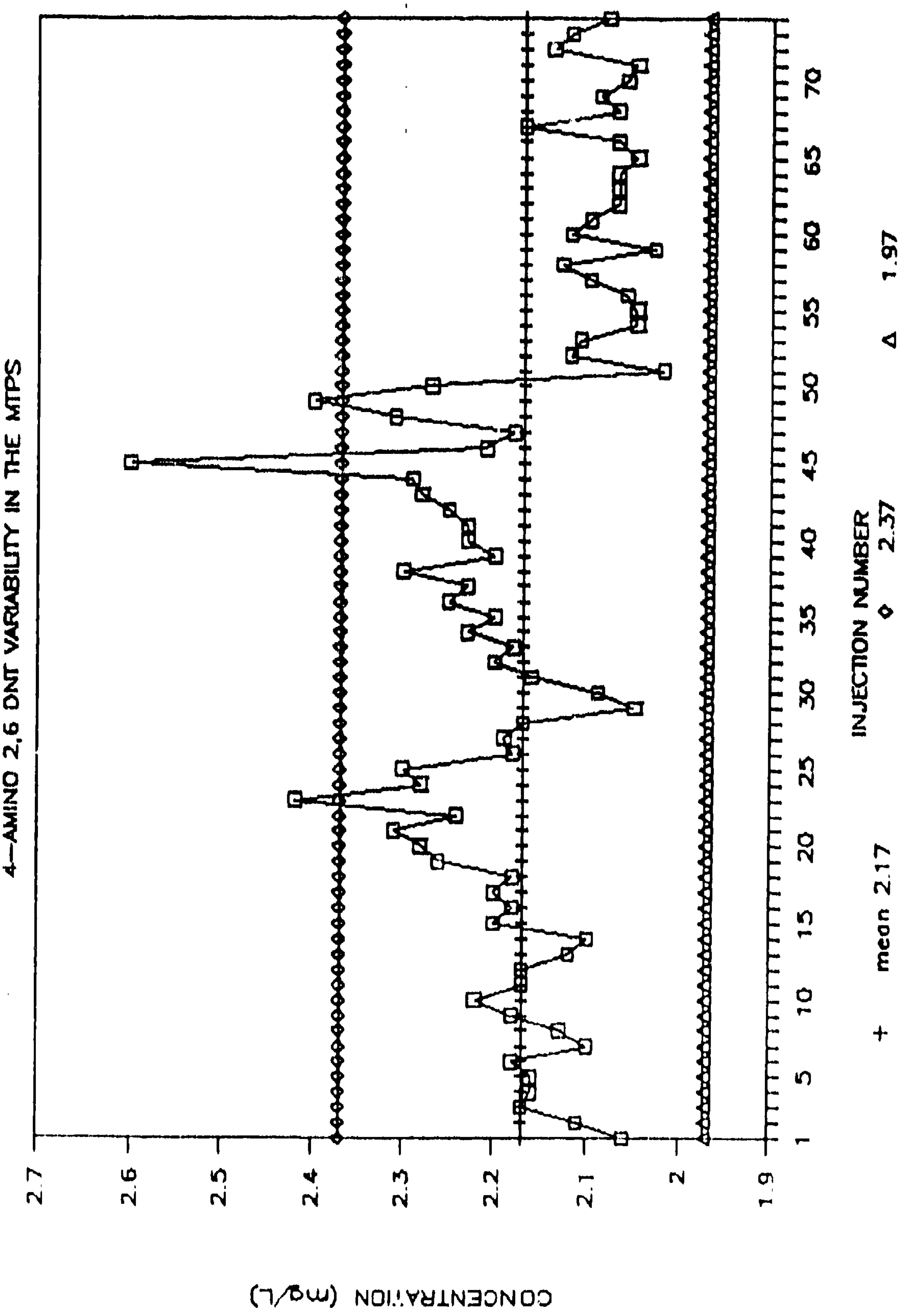


Fig. A8



Appendix A

Fig. A9

DNB VARIABILITY IN THE MTPS

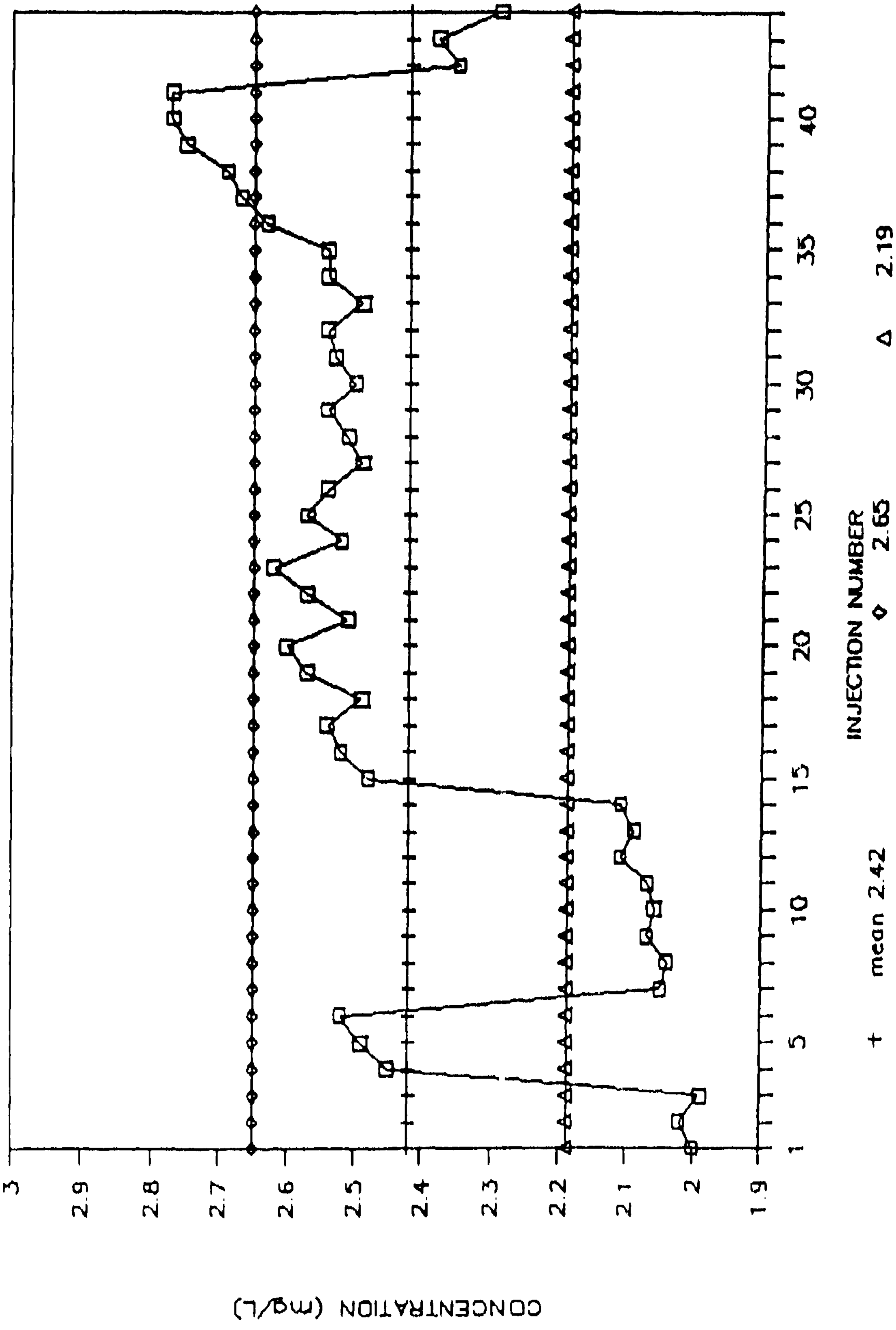


TABLE A1

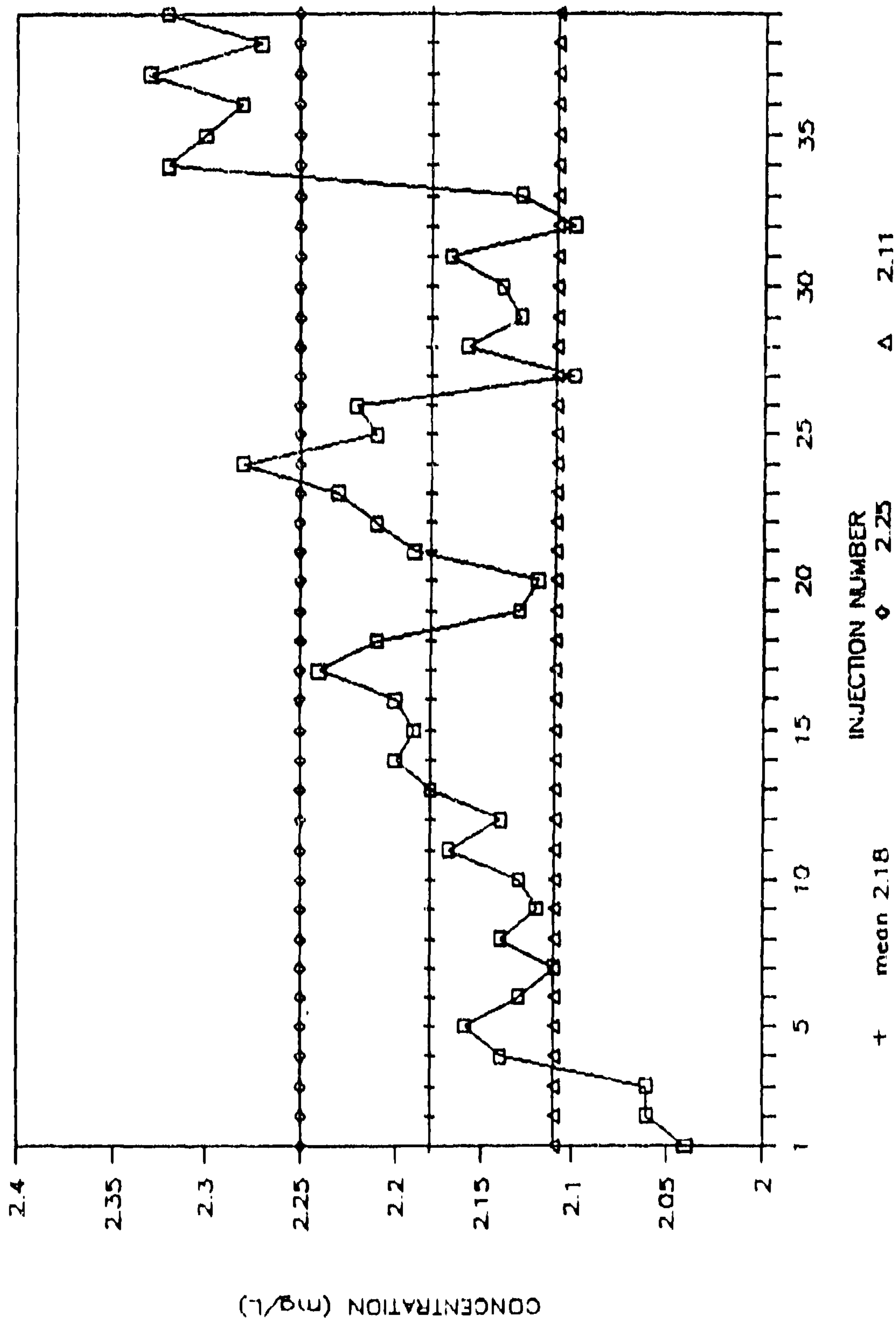
PERCENT RECOVERY BY SITE

COMPOUND	RADFORD %RECOVERY	STD	MILAN %RECOVERY	STD
HMX	108.4	4.5	102.07	4.39
TNB	111.0	2.0	110.56	8.90
RDX	105.35	1.9	104.06	7.34
DNB	93.85	1.3	NONE	
TNT	99.50	1.2	108.91	6.74
2,4 DNT	103.45	1.3	107.24	6.84
2,6 DNT	100.95	1.9	107.02	8.81
2-AM 4,6 DNT	104.10	1.2	NONE	
4-AM 2,6 DNT	104.05	2.5	NONE	

COMPOUND	PUEBLO %RECOVERY	STD	ANNISTON %RECOVERY	STD
HMX	NONE		86.45	8.58
RDX	NONE		84.06	8.15
TNB	91.20	7.28	95.69	11.45
TNT	94.04	8.63	98.99	12.43
2,4 DNT	77.07	4.48	78.84	7.54
2,6 DNT	77.89	4.97	79.78	8.69
2-AM 4,6 DNT	67.63	14.43	73.48	21.87
4-AM 2,6 DNT	86.93	14.80	144.31	42.35

Fig. A10

DNB IN ACETONITRILE



Appendix A

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APPENDIX B

CRITERIA OF DETECTION

a. Explosives in Soil.

A criterion of detection (minimum accurate quantitation limit) was calculated from data of analysis of soil extracts in which the extraction and analysis steps were performed in triplicate and repeated in their entirety on four separate days. Criterion of detection of soil extracts was determined on a single soil type (Milan Soil). The soil was ground and subsamples were spiked with 0.0, 0.4, 0.8, 1.63, 3.13, 6.25, 12.5, 25, and 50 mg/kg of a mixture of HMX, TNB, RDX, TNT, 2,4-DNT, 2,6-DNT, 2-AM, and 4-AM. For purposes of calculation the concentration of the explosives spiked onto the soil was assumed to be the "target concentration" in the soil at the time of analysis. The soils were extracted in the manner used for samples and the extracts analyzed. Target concentrations and the analytically derived values of the replicates were entered into the USATHAMA program for calculation of criteria of detection (Tables F1 - F8). This program generates a two dimensional plot with found values (analytically derived) as the dependent variable and target concentration as the independent variable (Figures F1 - F8). Linear regression of this relationship produces an equation in the form $Y = mx + b$ with;

Y = the found concentration
b = the found concentration intercept
m = the slope of the line

The variance about the regression line is plotted, thus generating parallel lines above and below the regression line. At the point where the line representing the mean minus the variance contacts the ordinate, values of Y can no longer be reliably distinguished from zero (Figures F9 - F16). Thus, criterion of detection is defined as the lowest concentration of analyte in an environmental sample which can be reliably distinguished from zero. Results of criterion of detection of soil extraction studies are summarized in Table F9. The criterion of detection levels from soil are:

Compound	Criterion of Detection
HMX	2.9 mg/kg
TNB	2.4 mg/kg
RDX	5.8 mg/kg
DNT	6.1 mg/kg
2,4-DNT	5.7 mg/kg
2,6-DNT	5.2 mg/kg
2-AM	15.4 mg/kg
4-AM	14.6 mg/kg

b. Explosives in Leachates.

In addition to the work done with soil extracts, criterion of detection was also performed for the leachates. The criterion of detection for these samples corresponds to the quantitation limit of the instrument because no sample preparation steps were employed.

The multipart standard containing HMX, TNB, RDX, TNT, 2,4-DNT, 2,6-DNT, 2-AM, and 4-AM was prepared at 1000 mg/L. This solution was diluted in a serial fashion to yield concentrations of 10, 5, 2.5, 1.25, 0.63, 0.32, 0.16, 0.08, 0.04, and 0.02 mg/L. These concentrations were analyzed in triplicate on four separate days and the results used to calculate the criterion of detection for each compound. Two separate criterion of detection studies were completed for the aqueous leachates and data from both studies are presented. Data from the first and second iteration of this work are identified by the small letter "a and b" after the table or figure number. For purposes of calculation the concentration of the explosives spiked into solution was the "target concentration". Target concentrations and the analytically derived values of the replicates were entered into the USATHAMA program for calculation of criteria of detection (Tables F10 - F17). This program generates a two dimensional plot with found values (analytically derived) as the dependent variable and target concentration as the independent variable (Figures F17 - F24). Linear regression of this relationship produces an equation in the form Y = mx + b with;

Y = the found concentration
b = the found concentration intercept
m = the slope of the line

The variance about the regression line is plotted, thus generating parallel lines above and below the regression line. At the point where the line representing the mean minus the variance contacts the ordinate, values of Y can no longer be reliably distinguished from zero (Figures F25 - F32). Thus, criterion of detection is defined as the lowest concentration of analyte in an environmental sample which can be reliably distinguished from zero. Results of criterion of detection of leachate studies are summarized in Table F18. The criterion of detection levels for water and solvent are:

Compound	Criterion of Detection
HMX	0.14 mg/L
TNB	0.14 mg/L
RDX	0.12 mg/L
DNB	0.15 mg/L
TNT	0.09 mg/L
2,4 DNT	0.17 mg/L
2,6 DNT	0.36 mg/L
2-AM	0.14 mg/L
4-AM	0.14 mg/L

Table F1

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name:	SOIL EXTRACTION	Units of Measure:	mg/Kg
Method Number:	1	Laboratory:	RW
Compound:	HMX	Analysis Date	03/18/92
		Matrix:	SF

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- / - Model through the Origin -

Model with Intercept: Y = (-0.24876344) + (0.854201200)X

Model through the Origin: Y = (0.846765184)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	231.3894150	94	2.461589521	235.1184280	95	2.474930821
Total Error:	227.2558750	88	2.582453125	227.2558750	88	2.582453125
Lack of Fit:	4.133540000	6	0.688923333	7.862553000	7	1.123221857

LOF F-Ratio(F): 0.266770896 LOF F-Ratio(F): 0.434943754
Critical 95% F: 2.25 Critical 95% F: 2.17

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted Calculated F: 1.514880108 Critical 95% F: 4

****

TABLE OF DATA POINTS Targets: 8 Measures per Target: 12

	Target Value	Found Concentration				
1:	50	41.500000	43.200000	42.300000	45.600000	46.500000
		48.500000	40.400000	41.900000	42.400000	39.700000
		38.900000	39			
2:	25	20.900000	21.400000	21.200000	22.900000	22.700000
		23	21.700000	21.700000	21.800000	19.400000
		19.400000	19.500000			
3:	12.500000	10.700000	10.600000	10.300000	9.9400000	9.2600000
		12.500000	10.400000	10.300000	9.6000000	10
		14.300000	1.2000000			
4:	6.2500000	5.2000000	4.5400000	4.8000000	5	5.0900000
		5.1900000	5.1000000	4.8000000	5.1000000	5.1900000
		4.9000000	4.9000000			

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name:	SOIL EXTRACTION	Units of Measure:	mg/Kg
Method Number:	1	Laboratory:	RW
Compound:	HMX	Analysis Date	03/18/92
		Matrix:	SF

TABLE OF DATA POINTS Targets: 8 Measures per Target: 12

	Target Value	Found Concentration				
5:	3.1300000	2.6700000	2.4800000	2.4800000	2.7000000	2
		2.3000000	2.7700000	2.6700000	2.4800000	2.5000000
		2.5000000	2.6000000			
6:	1.5600000	1.1200000	1.9000000	1.2100000	1.0300000	1.2200000
		1.8000000	1.3200000	0.9300000	0.6400000	1.4000000
		1.1000000	0.9900000			
7:	0.8000000	0.8400000	0.7000000	0.6500000	0.6400000	0.7300000
		0.5400000	0.4400000	0.5400000	0.5400000	0.6400000
		0.2500000	0			
8:	0.4000000	0.4400000	0.6900000	0.6100000	0	0
		0	0	0	0	0
		0	0			

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F2

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name:	SOIL EXTRACTION	Units of Measure:	mg/Kg
Method Number:	1	Laboratory:	RW
Compound:	TNB	Analysis Date	03/18/92
		Matrix:	SF

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- Y = (0.141512116) + (0.905973870)X

- Model through the Origin - Y = (0.910203938)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	176.8768300	94	1.881668404	178.0835540	95	1.874563726
Total Error:	168.7549830	88	1.917670261	168.7549830	88	1.917670261
Lack of Fit:	8.121847000	6	1.353641167	9.328571000	7	1.332653000

LOF F-Ratio(F): 0.705877957 LOF F-Ratio(F): 0.694933340
Critical 95% F: 2.25 Critical 95% F: 2.17

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted   Calculated F: 0.641305342   Critical 95% F: 4

****

TABLE OF DATA POINTS   Targets: 8   Measures per Target: 12

	Target Value	Found Concentration				
1:	50	45.600000	47.500000	46.100000	43.300000	43.800000
		51.600000	42	45.300000	46.100000	45.900000
		44.900000	45.400000			
2:	25	23	22.900000	22.900000	23.400000	23.500000
		23.500000	18.900000	21.300000	20.400000	23.900000
		23.700000	23.800000			
3:	12.500000	11.900000	11.700000	11.300000	10.900000	7.4700000
		5.6300000	12.900000	11.700000	11.200000	11.600000
		12	12.700000			
4:	6.2500000	5.9100000	5.9100000	6.0900000	5.7000000	5.3000000
		5.6800000	5.9100000	5.8600000	5.8000000	7
		7.2000000	6.8000000			

Table F2 (Cont.)

CERTIFICATION ANALYSIS Report Date: 10/12/93

Method Name: SOIL EXTRACTION
Method Number: 1
Compound: TNB

Units of Measure: mg/Kg
Laboratory: RW
Analysis Date 03/18/92
Matrix: SF

TABLE OF DATA POINTS Targets: 8 Measures per Target: 12

	Target Value	Found Concentration				
5:	3.1300000	4.2000000	4.2000000	4.1000000	3.0400000	3.0400000
		2.7500000	3.1000000	2.2900000	2.2300000	2.8600000
		2.9800000	2.9200000			
6:	1.5600000	1.4800000	1.4800000	1.5400000	1.5400000	0.8500000
		1.0800000	1.2000000	1.5400000	2.8000000	1.3700000
		2.3000000	2.9000000			
7:	0.8000000	0.2300000	0.2200000	0.2100000	0.6200000	0.6200000
		0.5600000	0.7900000	0.5100000	0.3300000	0.9100000
		0.9100000	0.7900000			
8:	0.4000000	0.2900000	2.6000000	2.6000000	2	2
		0	0	0	0	0
		0	0			

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F3

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name:	SOIL EXTRACTION		Units of Measure:	mg/Kg
Method Number:	1		Laboratory:	RW
Compound:	RDX		Analysis Date	03/18/92
			Matrix:	SF

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- Y = (-0.11490761) + (0.744807248)X

- Model through the Origin - Y = (0.741372440)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	703.3546070	94	7.482495819	704.1502500	95	7.412107895
Total Error:	684.0883830	88	7.773731625	684.0883830	88	7.773731625
Lack of Fit:	19.26622400	6	3.211037333	20.06186700	7	2.865981000

LOF F-Ratio(F): 0.413062540 LOF F-Ratio(F): 0.368675063

Critical 95% F: 2.25 Critical 95% F: 2.17

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted Calculated F: 0.106333905 Critical 95% F: 4

****

TABLE OF DATA POINTS Targets: 8 Measures per Target: 12

	Target Value	Found Concentration				
1:	50	38.800000	39.900000	38.300000	25.900000	26.400000
		42.100000	39.700000	40.200000	40.020000	39.500000
		38.700000	38.700000			
2:	25	19.500000	19.800000	20.400000	19.500000	19.500000
		19.100000	6.2100000	12	11.500000	21.400000
		21.400000	21.100000			
3:	12.500000	10	10.100000	9.2500000	9.4000000	9.1000000
		2.4200000	11.700000	10.500000	10.100000	15.100000
		10.800000	10.800000			
4:	6.2500000	5.5000000	6	4.8000000	5	5.1500000
		4.8500000	4.6000000	4.6000000	4.2400000	4.4000000
		5.1500000	4.8500000			

Appendix B

Table F3 (Cont.)

CERTIFICATION ANALYSIS   Report Date: 10/12/93

Method Name: SOIL EXTRACTION
Method Number: 1
Compound: RDX

Units of Measure: mg/Kg
Laboratory: RW
Analysis Date 03/18/92
Matrix: SF

TABLE OF DATA POINTS   Targets: 8   Measures per Target: 12

	Target Value	Found Concentration				
5:	3.1300000	2.2700000	2.1200000	2.1200000	2.4000000	0.6100000
		0.7600000	2.1200000	2.2700000	2.4300000	2.2000000
		2.3000000	2.8000000			
6:	1.5600000	2	1.7000000	1.2000000	0.4500000	1.0600000
		1.0600000	0.4500000	0	0	0.6100000
		1.6700000	1.0600000			
7:	0.8000000	0	0	0	0	0
		0	0	0	1.3000000	1
		1.7000000	0.9200000			
8:	0.4000000	0.9000000	0	0	0	0
		0	0	0	0	0
		0	0			

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F4

CERTIFICATION ANALYSIS Report Date: 10/12/93

Method Name:	SOIL EXTRACTION	Units of Measure:	mg/Kg
Method Number:	1	Laboratory:	RW
Compound:	TNT	Analysis Date	03/19/92
		Matrix:	SF

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- $Y = (-0.03971536) + (0.884832944)X$

- Model through the Origin - $Y = (0.883644807)X$

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	1095.426110	94	11.65346926	1095.521060	95	11.53180063
Total Error:	1069.960770	88	12.15864511	1069.960770	88	12.15864511
Lack of Fit:	25.46534000	6	4.244223333	25.56029000	7	3.651470000

LOF F-Ratio(F): 0.349070418 LOF F-Ratio(F): 0.300318824

Critical 95% F: 2.25 Critical 95% F: 2.17

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted Calculated F: 0.008147788 Critical 95% F: 4

****

TABLE OF DATA POINTS Targets: 8 Measures per Target: 12

	Target Value	Found Concentration				
1:	50	50.600000	46.800000	51.200000	28.300000	27.200000
		56.700000	45.700000	47.700000	47.700000	40.200000
		41.300000	41.400000			
2:	25	20.700000	19.700000	20.600000	22.400000	23.700000
		23.100000	14.800000	25.500000	26.300000	24.600000
		23.800000	25.300000			
3:	12.500000	12.600000	10.800000	10.500000	13.200000	6.4400000
		10.400000	11.300000	12.300000	11.600000	14.100000
		13.700000	17.800000			
4:	6.2500000	8.3000000	3.7000000	7.7000000	5.7000000	5.6300000
		5.9200000	4.2000000	5	5.3400000	5.9200000
		5.5600000	5.5600000			

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name: SOIL EXTRACTION
Method Number: 1
Compound: TNT

Units of Measure: mg/Kg
Laboratory: RW
Analysis Date 03/19/92
Matrix: SF

TABLE OF DATA POINTS

Targets: 8 Measures per Target: 12

	Target Value	Found Concentration				
5:	3.1300000	2.1800000	2.7800000	2.7800000	2.2000000	1.5300000
		1.1600000	2.4800000	1.9700000	2.2600000	2
		2.1000000	1.8000000			
6:	1.6500000	1.2000000	1.4000000	1.5000000	1.8200000	1.5300000
		0.9400000	1.2400000	1.4600000	1.6000000	1.3100000
		0.9400000	0.9500000			
7:	0.8000000	0.2600000	0.6500000	0.5800000	0.5800000	0
		0	0	0	0	1
		0.7000000	0			
8:	0.4000000	0	0	0	0	0
		0	1.6500000	0	0	0
		0	0			

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F5

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name:	SOIL EXTRACTION	Units of Measure:	mg/Kg
Method Number:	1	Laboratory:	RW
Compound:	2,4DNT	Analysis Date	03/19/92
		Matrix:	SF

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- · Model through the Origin ·

$Y = (-0.59402705) + (0.809804126)X$ $\quad$ $Y = (0.792047521)X$

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	792.6388120	94	8.432327787	813.9022350	95	8.567391947
Total Error:	777.3167500	88	8.833144886	777.3167500	88	8.833144886
Lack of Fit:	15.32206200	6	2.553677000	36.58548500	7	5.226497857

LOF F-Ratio(F): 0.289101677 $\quad$ LOF F-Ratio(F): 0.591691626

Critical 95% F: 2.25 $\quad$ Critical 95% F: 2.17

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted $\quad$ Calculated F: 2.521655175 $\quad$ Critical 95% F: 4

****

TABLE OF DATA POINTS $\quad$ Targets: 8 $\quad$ Measures per Target: 12

	Target Value	Found Concentration				
1:	50	41.400000	40.200000	41.300000	40.200000	42.900000
		41.500000	26.700000	26.900000	43.200000	42.500000
		45.700000	46.400000			
2:	25	20.200000	21.200000	20.400000	12.500000	10.500000
		13.600000	23.700000	23.700000	23.900000	22.600000
		20.600000	19.700000			
3:	12.500000	12.100000	10.300000	16	10.200000	9.6200000
		9.4700000	9.4200000	6.4000000	6.7100000	11.400000
		11.800000	10.900000			
4:	6.2500000	4.5600000	4.8700000	5.3300000	2.9000000	5
		2.9500000	4.7100000	3.1800000	4.2500000	2.8000000
		3.4000000	3.2000000			

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name: SOIL EXTRACTION
Method Number: 1
Compound: 2,4DNT

Units of Measure: mg/Kg
Laboratory: RW
Analysis Date 03/19/92
Matrix: SF

TABLE OF DATA POINTS   Targets: 8   Measures per Target: 12

	Target Value	Found Concentration				
5:	3.1300000	2	2.1000000	1.8000000	2.7200000	1.7200000
		2.4900000	1.9000000	1.0300000	1.0300000	1.2600000
		1.6400000	0.0300000			
6:	1.5600000	0.5700000	0.5700000	0.5700000	0	0
		0	0.2600000	0.4900000	0	1.4000000
		1.4000000	1.5000000			
7:	0.8000000	0	0	0.8000000	0	0
		0	0	0	0	0
		0	0			
8:	0.4000000	0	0	0	0	0
		0	0.9900000	0	0	0
		0	0			

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F6

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name:	SOIL EXTRACTION	Units of Measure:	mg/Kg
Method Number:	1	Laboratory:	RW
Compound:	2,6DNT	Analysis Date	03/19/92
		Matrix:	SF

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- $Y = (-0.58428181) + (0.824346024)X$

- Model through the Origin - $Y = (0.806880723)X$

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	681.4978330	94	7.249976947	702.0693100	95	7.390203263
Total Error:	643.8581280	88	7.316569636	643.8581280	88	7.316569636
Lack of Fit:	37.63970500	6	6.273284167	58.21118200	7	8.315883143

LOF F-Ratio(F): 0.857407840 LOF F-Ratio(F): 1.136582245

Critical 95% F: 2.25 Critical 95% F: 2.17

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted Calculated F: 2.837454126 Critical 95% F: 4

****

TABLE OF DATA POINTS Targets: 8 Measures per Target: 12

	Target Value	Found Concentration				
1:	50	39.900000	31.400000	39.300000	44.300000	45.600000
		47.200000	42.843000	44.500000	39.500000	42.200000
		40.600000	24.600000			
2:	25	21.400000	21	20.400000	25.200000	24.100000
		24.200000	23.300000	22.400000	20.200000	20
		19.900000	14.500000			
3:	12.500000	10.900000	9.6200000	10.500000	9.8600000	6.6600000
		5.2400000	4.2900000	10.300000	11.700000	9.8600000
		11.100000	11.500000			
4:	6.2500000	2.8000000	3.4000000	3.2000000	4.4100000	5.1200000
		5.2400000	3.3000000	3.8000000	2.2700000	4.4100000
		4.7200000	4.5300000			

Table F6 (Cont.)

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name: SOIL EXTRACTION
Method Number: 1
Compound: 2,6DNT

Units of Measure: mg/Kg
Laboratory: RW
Analysis Date 03/19/92
Matrix: SF

TABLE OF DATA POINTS Targets: 8 Measures per Target: 12

	Target Value	Found Concentration				
5:	3.1300000	3.1000000	1.2000000	2.6300000	1.3000000	0.3700000
		0.4900000	1.0800000	1.3200000	1.4400000	3
		2.9000000	0			
6:	1.5600000	1.9000000	2.2000000	1.7000000	0	0
		0	0	0.2500000	0.6100000	0
		0	0			
7:	0.8000000	1.2000000	0	2	1.8000000	0
		0	0	0	0	0
		0	0			
8:	0.4000000	0	0	0	1.8000000	0
		0	0	0	0	0
		0	0			

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F7

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name:	SOIL EXTRACTION	Units of Measure:	mg/Kg
Method Number:	1	Laboratory:	RW
Compound:	2-AM	Analysis Date	03/19/92
		Matrix:	SF

ANALYSIS OF RESIDUAL VARIATIONS

--- Modol with Intercept --- Y = (-0.73266610) + (0.786218675)X

- Model through the Origin - Y = (0.764317883)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	5512.399130	94	58.64254394	5544.746050	95	58.36574789
Total Error:	5418.396520	88	61.57268773	5418.396520	88	61.57268773
Lack of Fit:	94.00261000	6	15.66710167	126.3495300	7	18.04993286

LOF F-Ratio(F): 0.254448884 LOF F-Ratio(F): 0.293148367
Critical 95% F: 2.25 Critical 95% F: 2.17

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted Calculated F: 0.551594761 Critical 95% F: 4

****

TABLE OF DATA POINTS Targets: 8 Measures per Target: 12

	Target Value	Found Concentration				
1:	50	60.400000	66.600000	70.400000	21	21.100000
		21.700000	35	47.500000	49.300000	17.400000
		18	24.100000			
2:	25	21.500000	15.300000	31.300000	38	33.400000
		13.500000	12.800000	12.500000	15.300000	16.400000
		18.300000	26.600000			
3:	12.500000	10.900000	10.500000	9.8600000	6.6600000	5.2400000
		4.2900000	10.300000	11.700000	9.8600000	7.6000000
		6.1000000	7.1000000			
4:	6.2500000	2.8000000	3.5000000	3.2000000	6.3500000	4.9400000
		1.2400000	4.7000000	4.3000000	2.3000000	3.8800000
		3.1800000	4.4100000			

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name:	SOIL EXTRACTION	Units of Measure:	mg/Kg
Method Number:	1	Laboratory:	RW
Compound:	2-AM	Analysis Date	03/19/92
		Matrix:	SF

TABLE OF DATA POINTS   Targets: 8   Measures per Target: 12

	Target Value	Found Concentration				
5:	3.1300000	1.0600000	2.1200000	0.1800000	0.9000000	0.5400000
		0.3600000	1.0700000	1.7700000	1.6000000	1.6000000
		1.3000000	0			
6:	1.5600000	0.4000000	0.9000000	0.1000000	0.7000000	0
		0	0	0	0	0
		0	0			
7:	0.8000000	0	0	0	0	0
		0	0	0.3000000	0.1000000	0.6000000
		0	0			
8:	0.4000000	0	0	1.8200000	0	0
		0	0	0	0	0
		0	0			

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F8

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name:	SOIL EXTRACTION	Units of Measure:	mg/Kg
Method Number:	1	Laboratory:	RW
Compound:	4-AM	Analysis Date	03/19/92
		Matrix:	SF

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- $Y = (-0.63682244) + (0.745388360)X$

- Model through the Origin - $Y = (0.726352519)X$

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	4427.118830	94	47.09700883	4451.556370	95	46.85848811
Total Error:	4191.612510	88	47.63196034	4191.612510	88	47.63196034
Lack of Fit:	235.5063200	6	39.25105333	259.9438600	7	37.13483714

LOF F-Ratio(F): 0.824048665 LOF F-Ratio(F): 0.779620173

Critical 95% F: 2.25 Critical 95% F: 2.17

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted Calculated F: 0.518876689 Critical 95% F: 4

****

TABLE OF DATA POINTS Targets: 8 Measures per Target: 12

	Target Value	Found Concentration				
1:	50	23	22.400000	25.600000	21.300000	37.600000
		35.600000	32.261000	6.4400000	67.600000	47.700000
		51.600000	47.700000			
2:	25	12.500000	13.100000	12.800000	12.800000	21.300000
		14.500000	19.800000	37.600000	35.600000	32.500000
		28.700000	16.100000			
3:	12.500000	9.9000000	8.3000000	7.7700000	9.1900000	6.5200000
		7.7700000	12.700000	15.800000	14.700000	7.1000000
		8.2000000	8.1000000			
4:	6.2500000	3.4000000	2.5000000	3.4000000	2.9700000	2.6200000
		2.7900000	3.1500000	2.9000000	1.9000000	3.1500000
		2.9700000	4.2100000			

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name: SOIL EXTRACTION
Method Number: 1
Compound: 4-AM

Units of Measure: mg/Kg
Laboratory: RW
Analysis Date 03/19/92
Matrix: SF

TABLE OF DATA POINTS

Targets: 8 Measures per Target: 12

	Target Value	Found Concentration				
5:	3.1300000	0.1300000	0	0.1300000	0	0
		0	0	0	0	0.7000000
		0.7000000	0.3400000			
6:	1.5600000	0	0	0	0	0
		0	0	0	0	0
		0	0			
7:	0.8000000	0	0	0	0	0
		0	0	0	0	0
		0	0			
8:	0.4000000	0	0	0	0	0
		0	0	0	0	0
		0	0			

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Figure F1

HMX

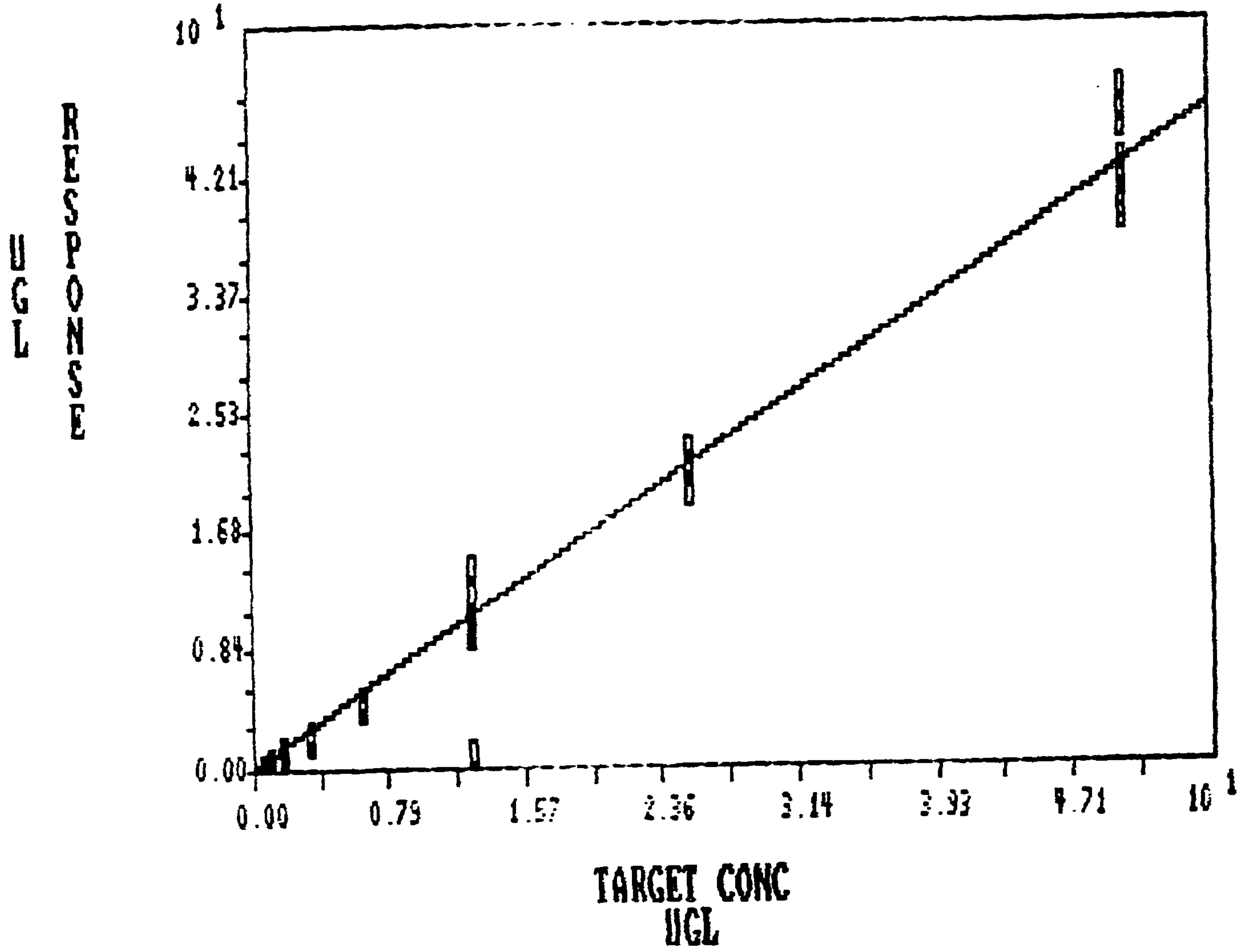


Figure F2

TNB

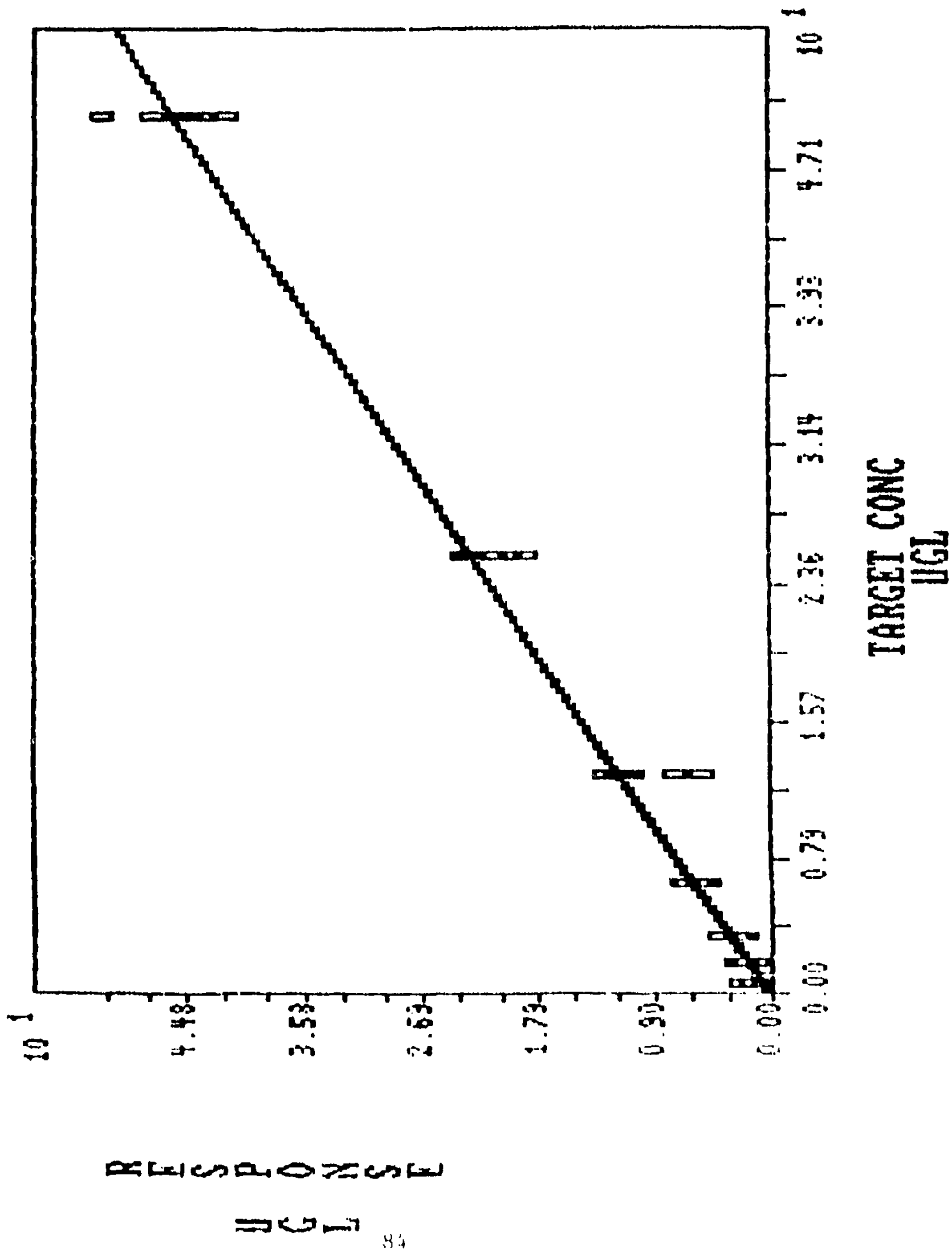


Figure F3

RDX

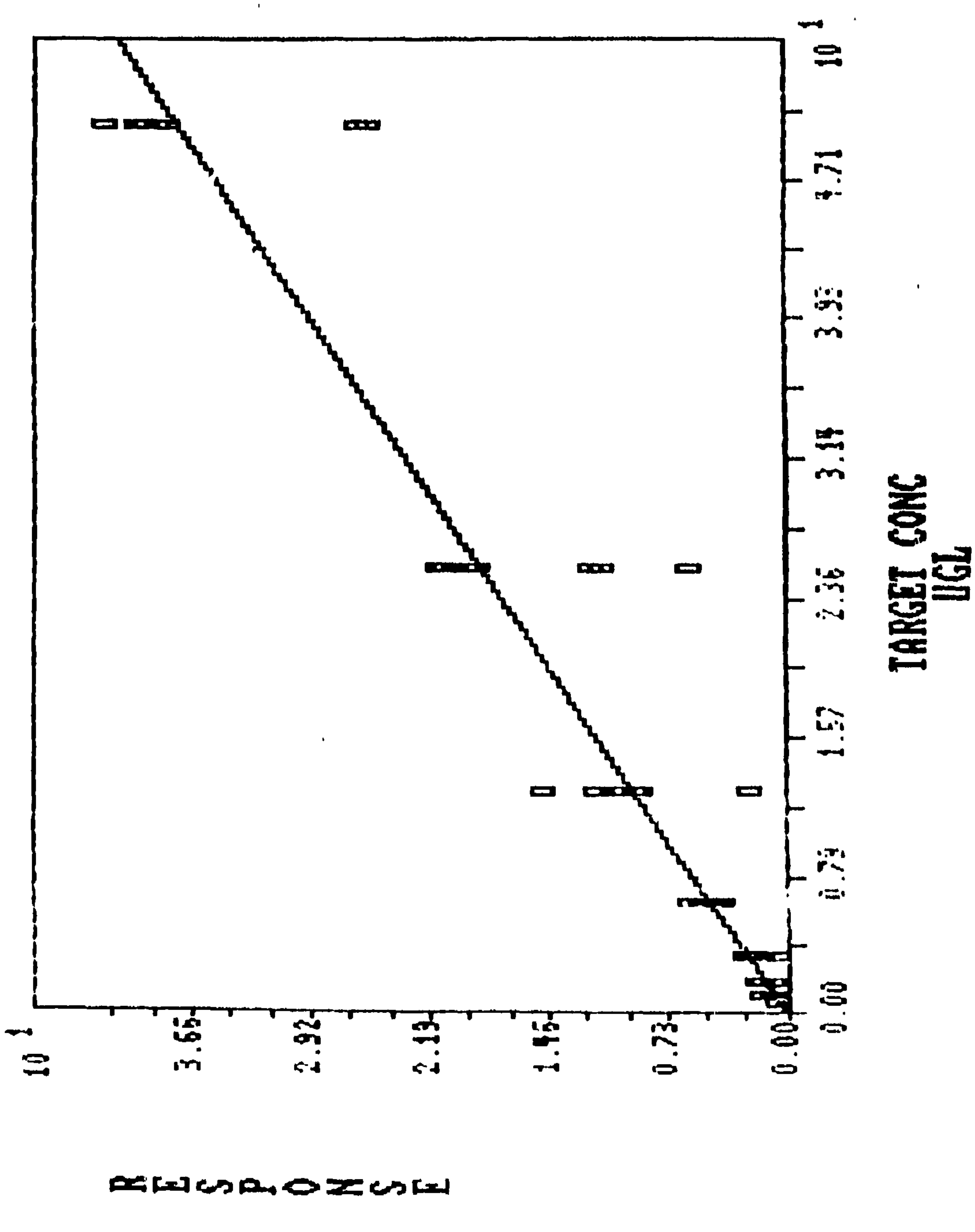


Figure F4

TNT

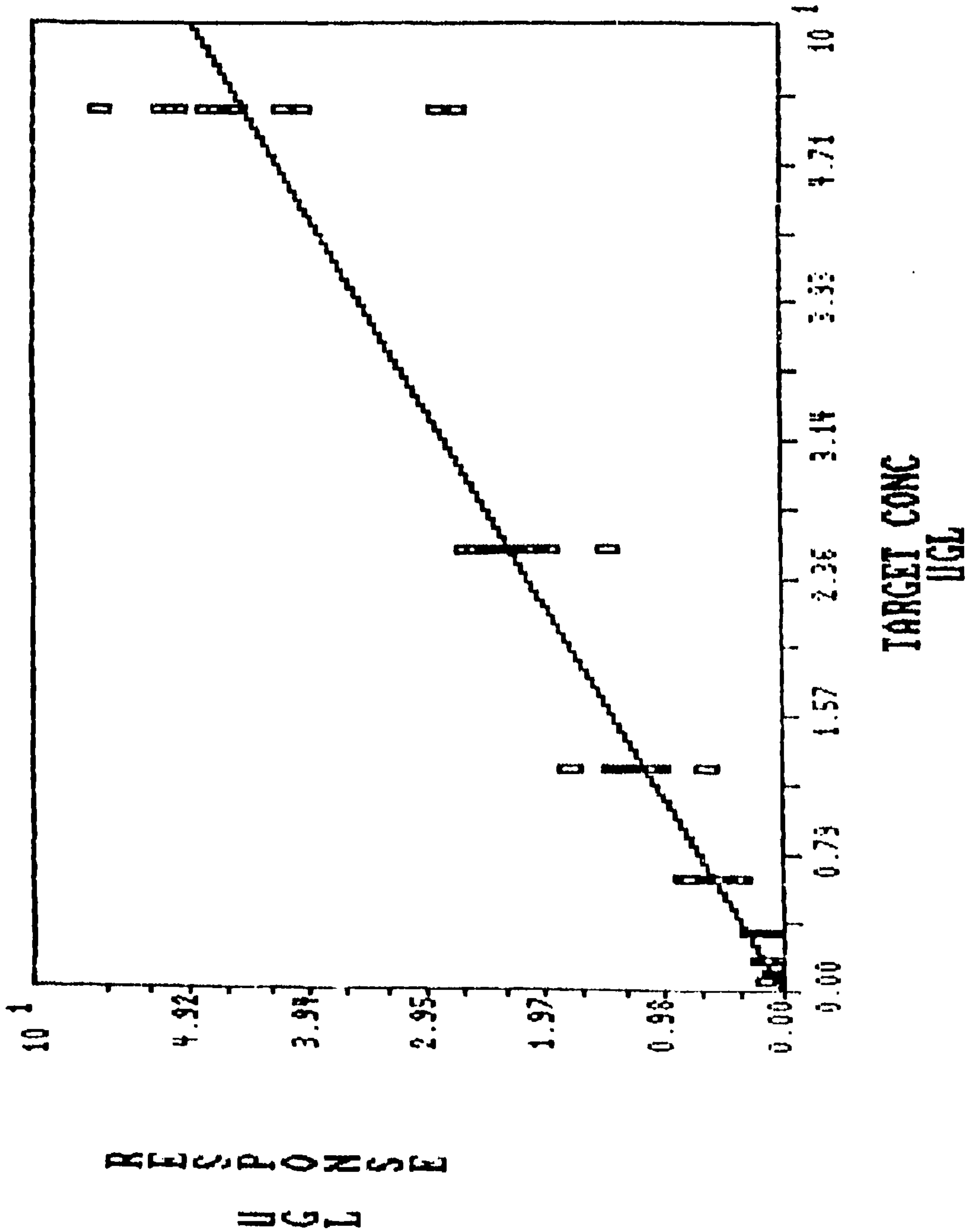


Figure F5

2,4DNT

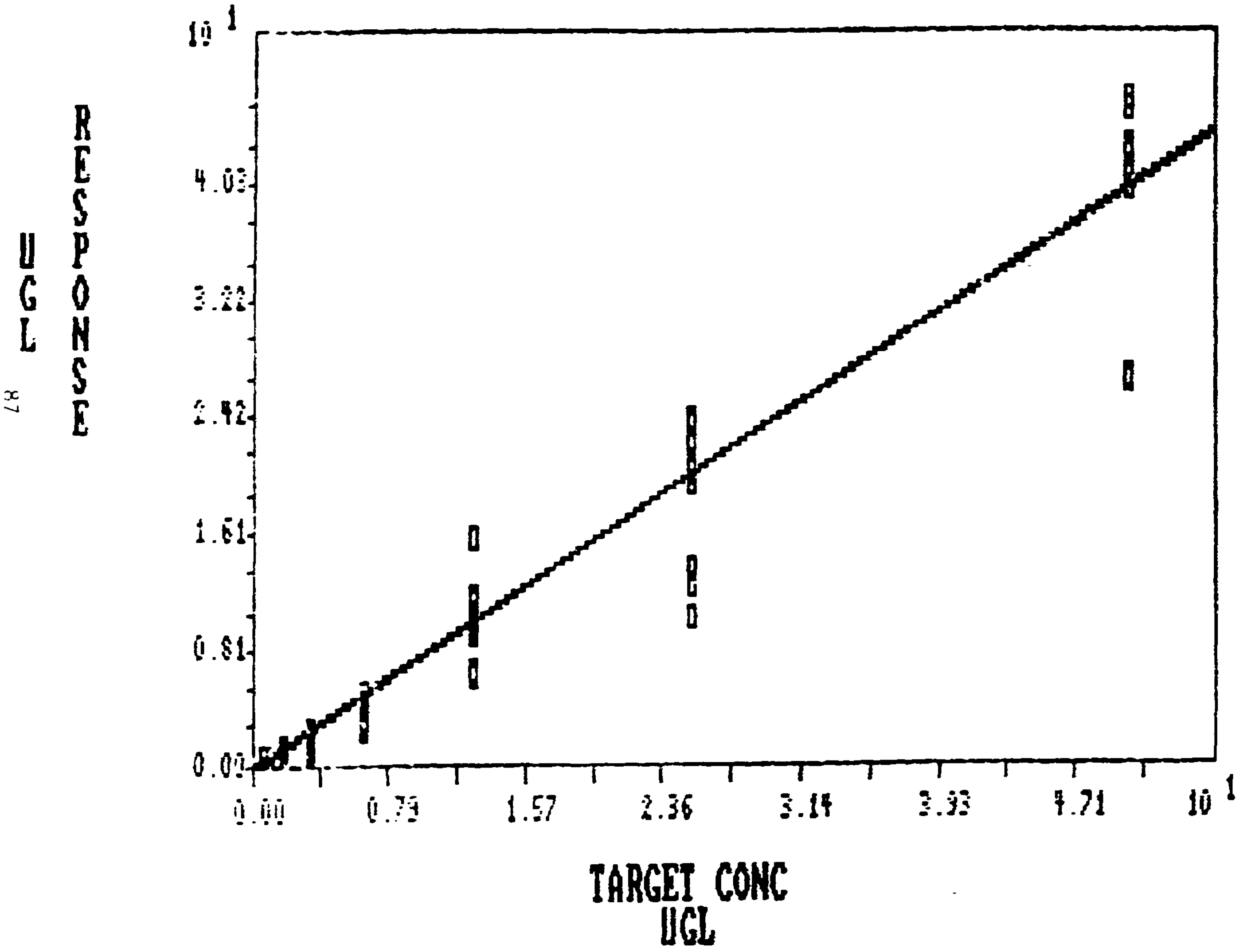
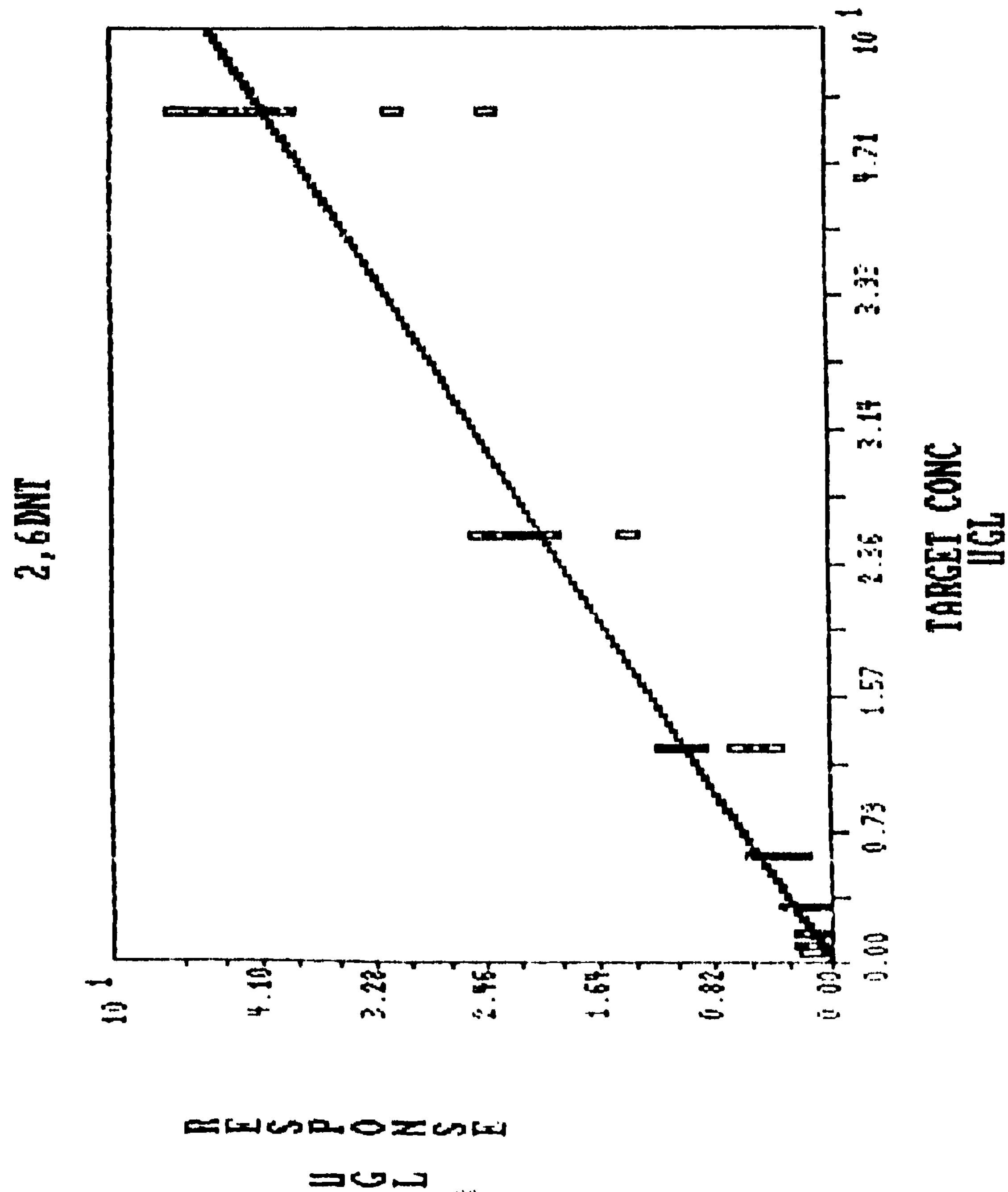


Figure F6



Appendix B

Figure F7

2-AM

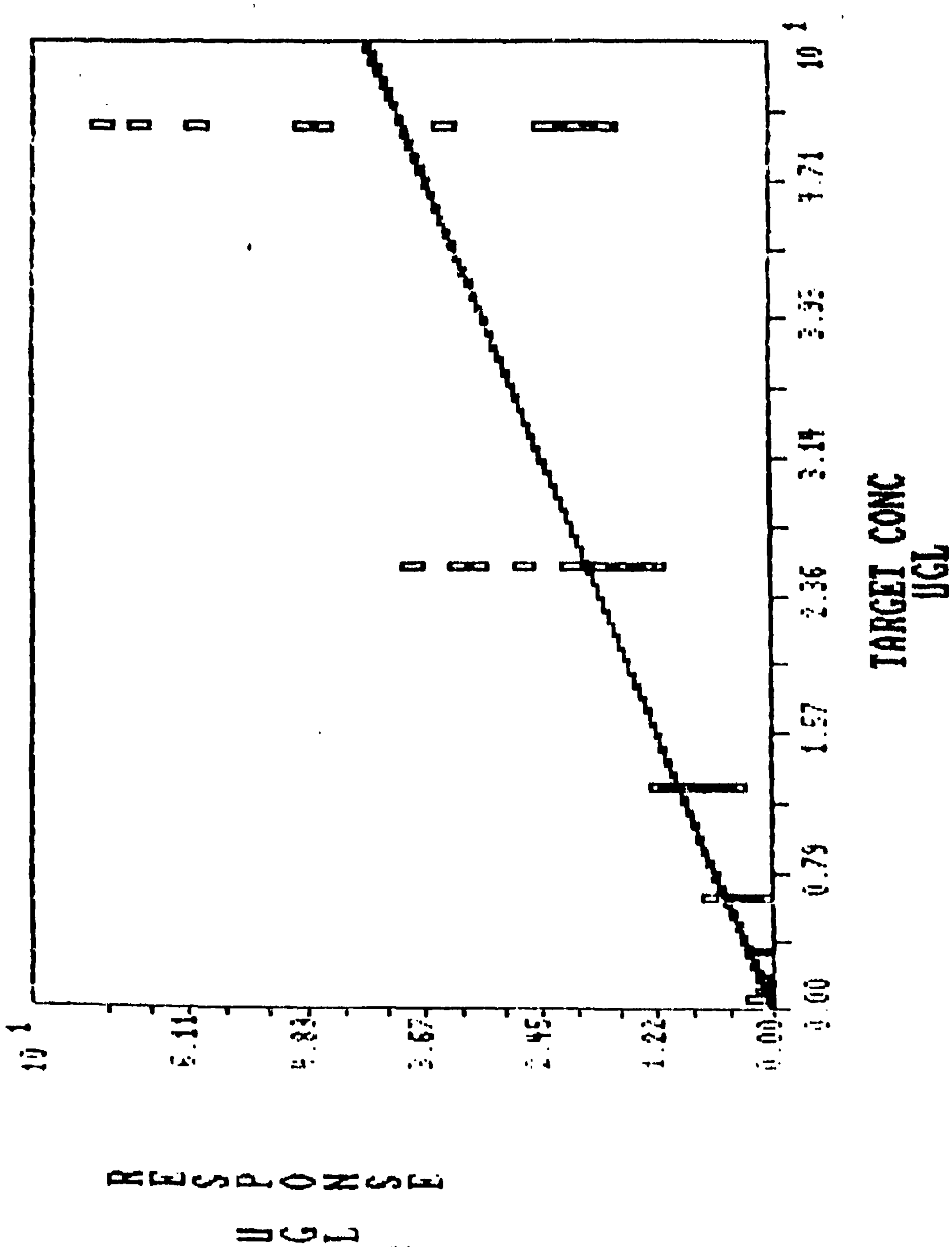


Figure F8

4-AM

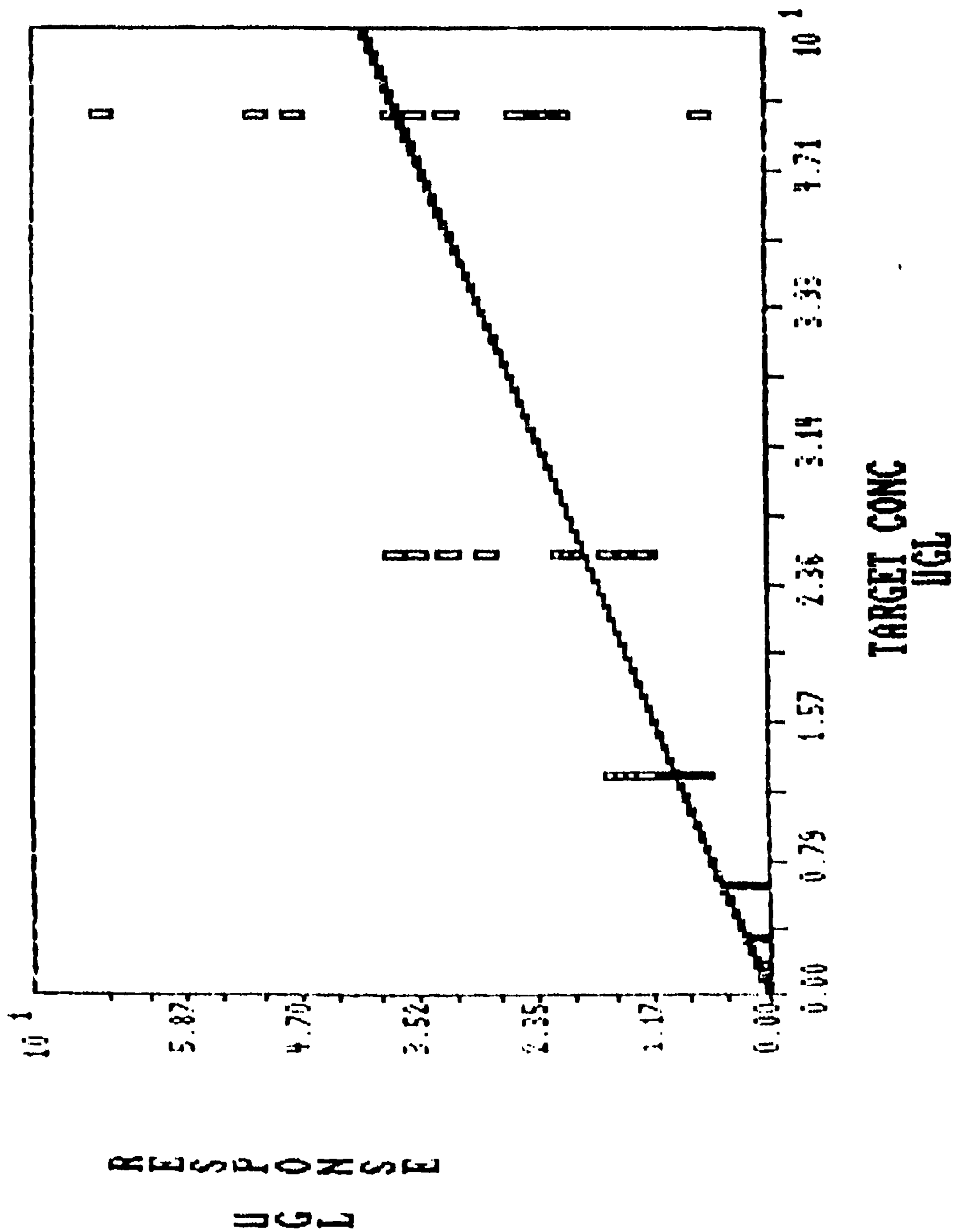


Figure F9

HMX

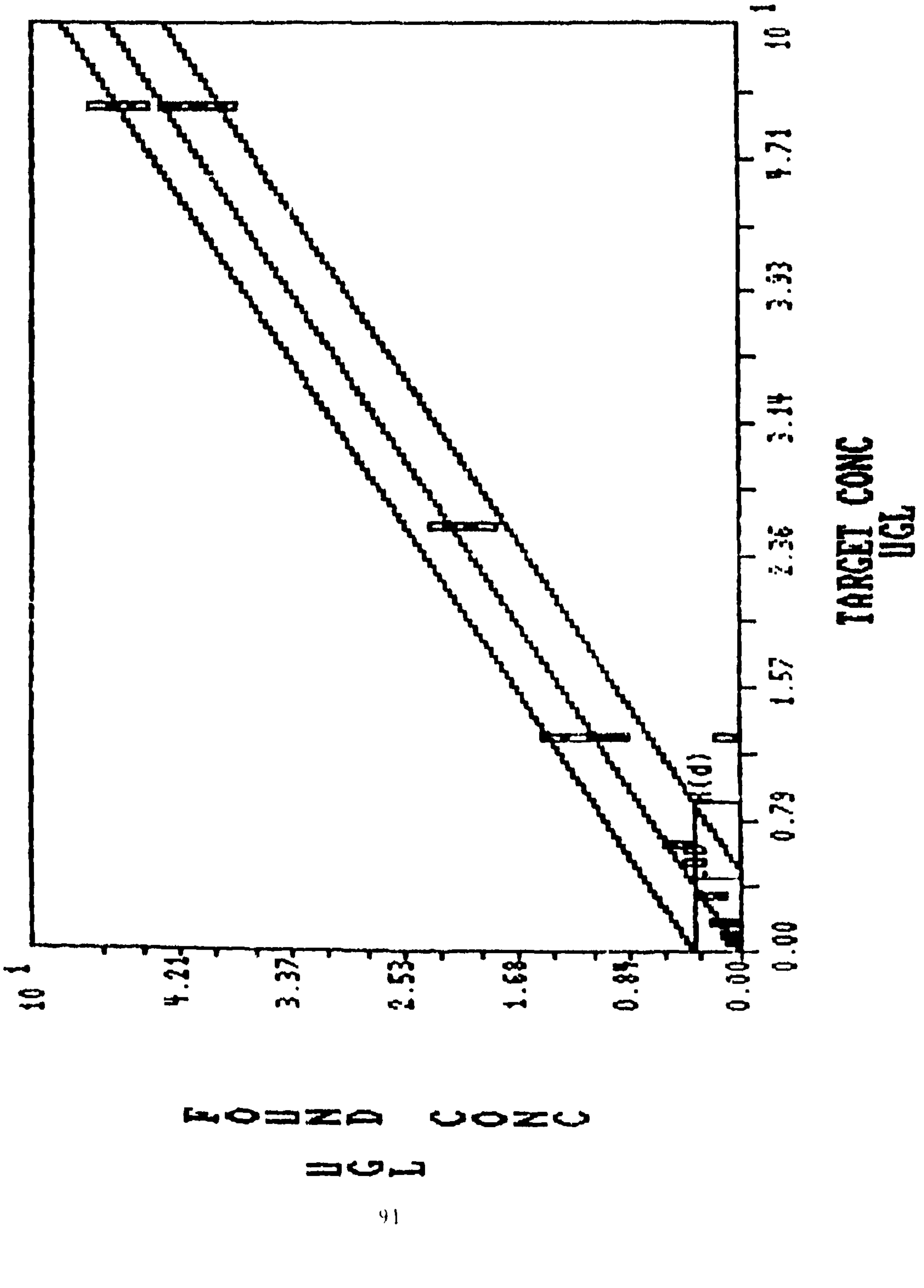
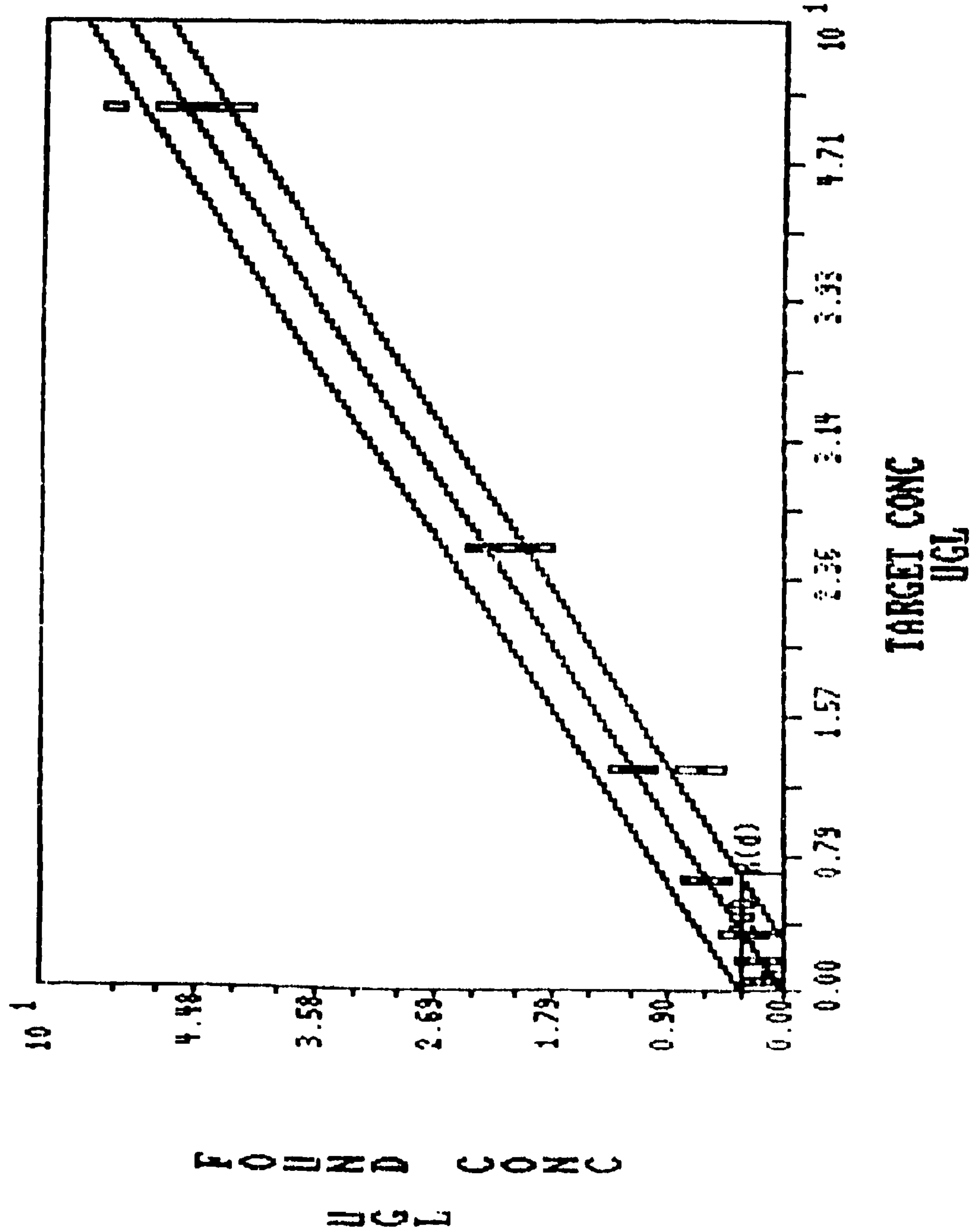


Figure F10
TNB



Appendix B

Figure F11

RDX

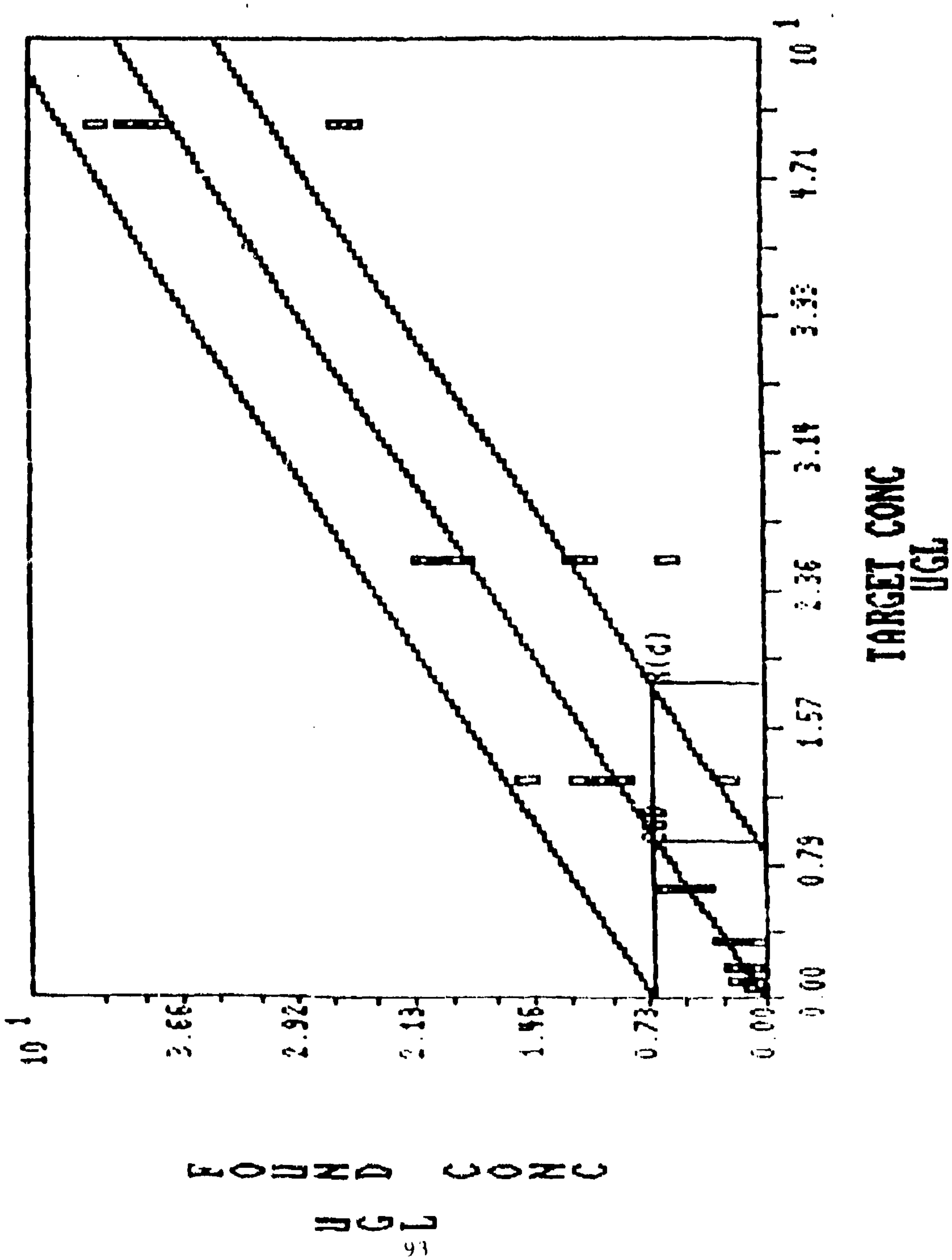
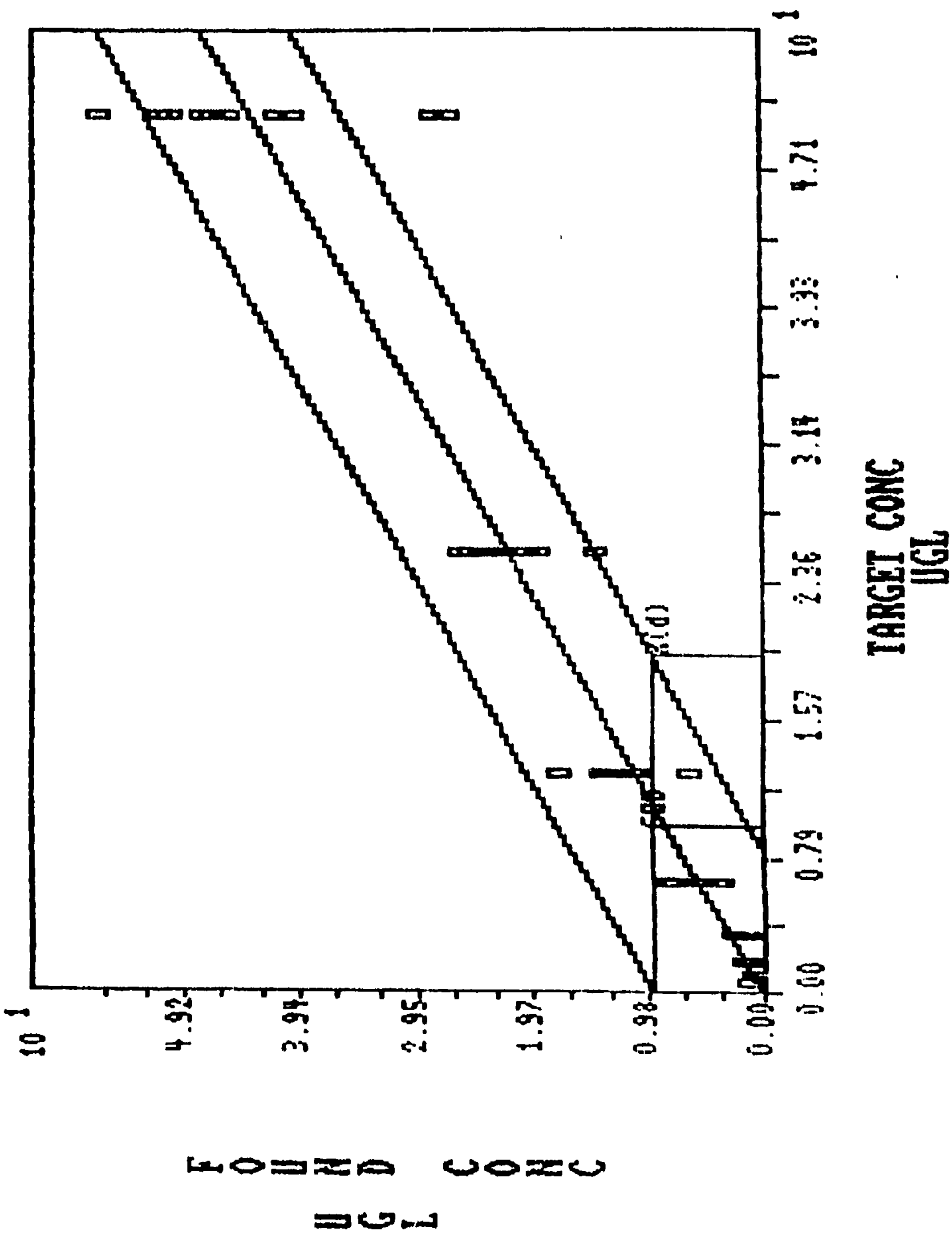


Figure F12

TNT



Appendix B

Figure F 13

2,4DNT

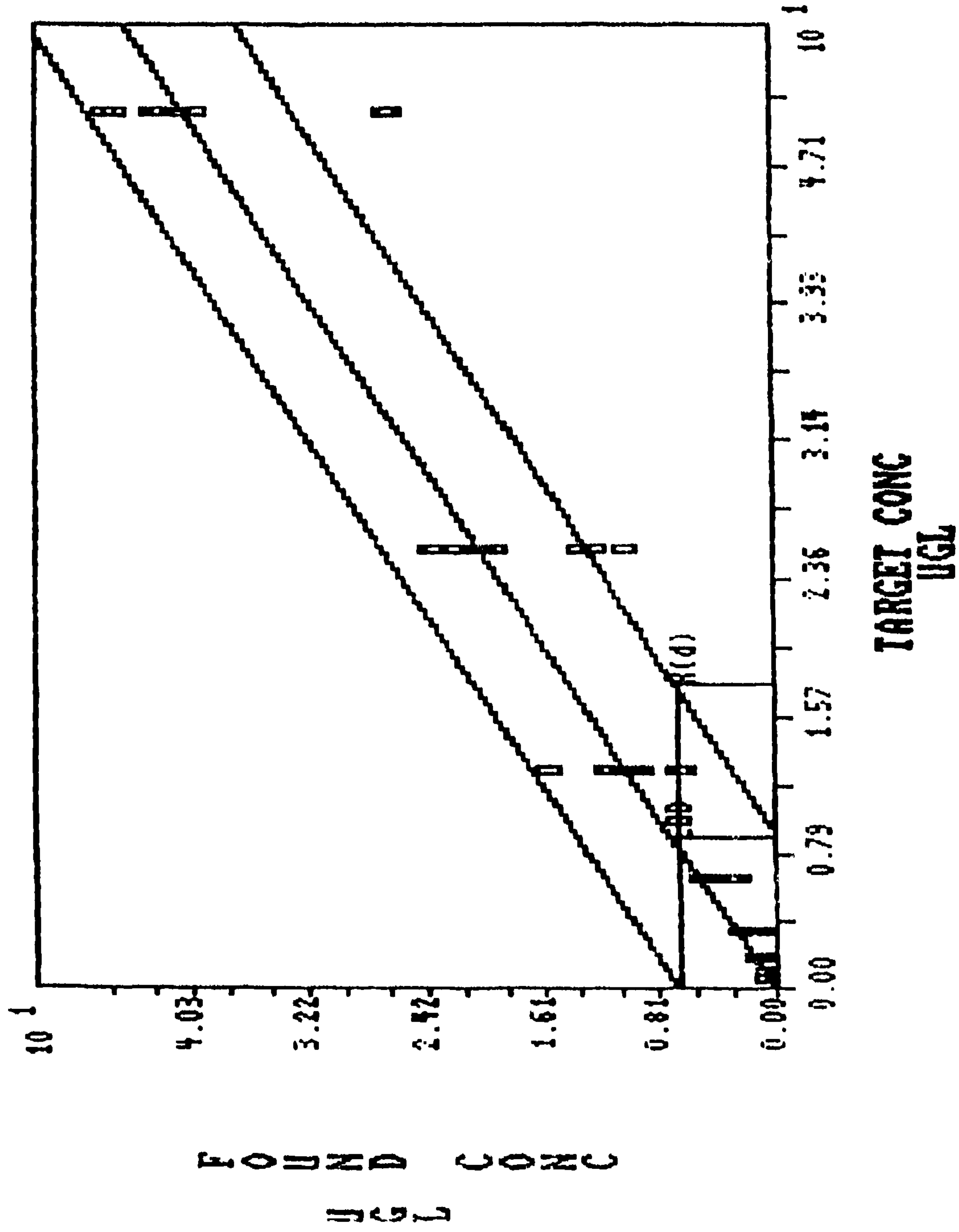
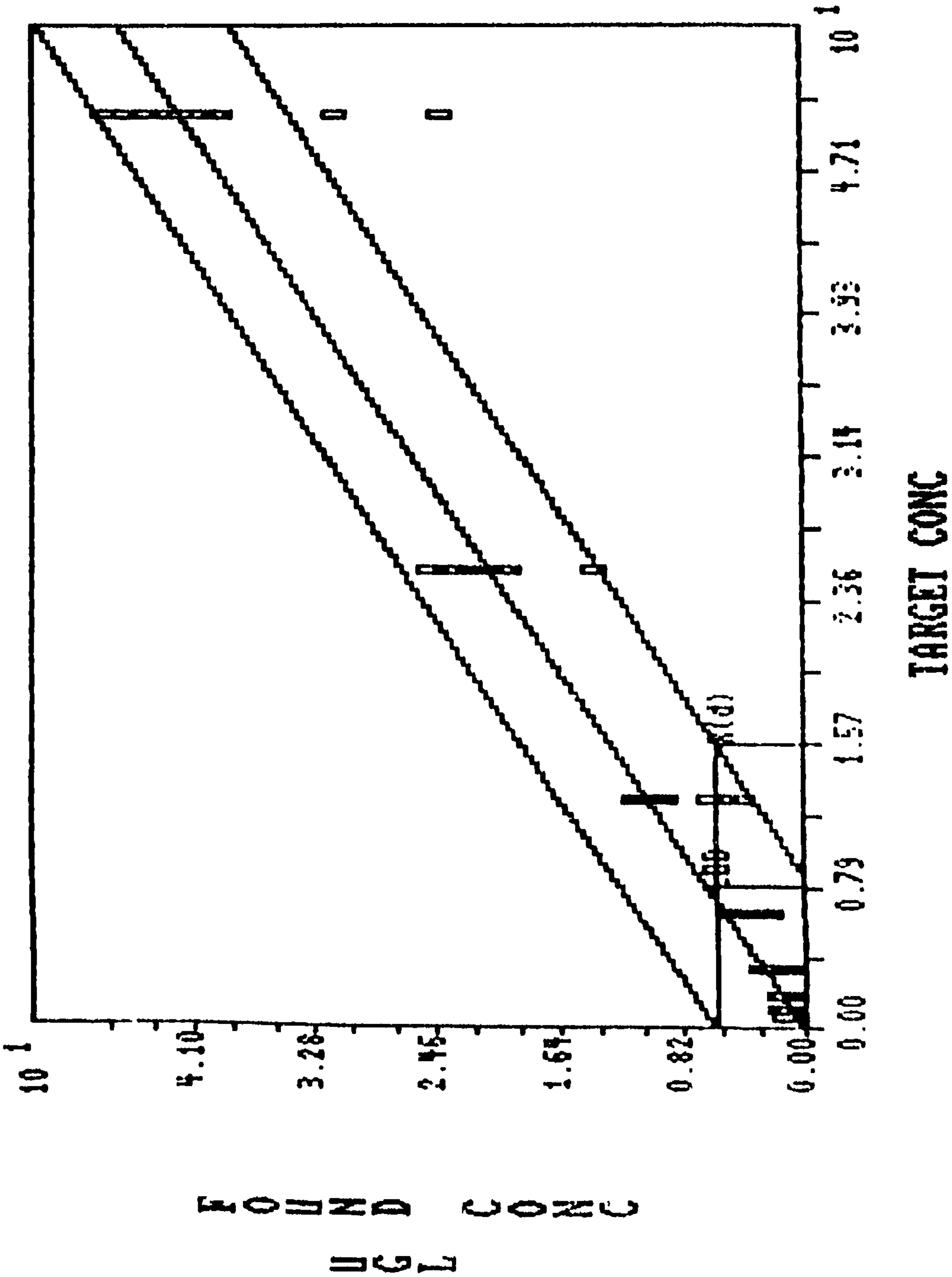


Figure F14

2,6DNT



Appendix B

Figure F15

2-AM

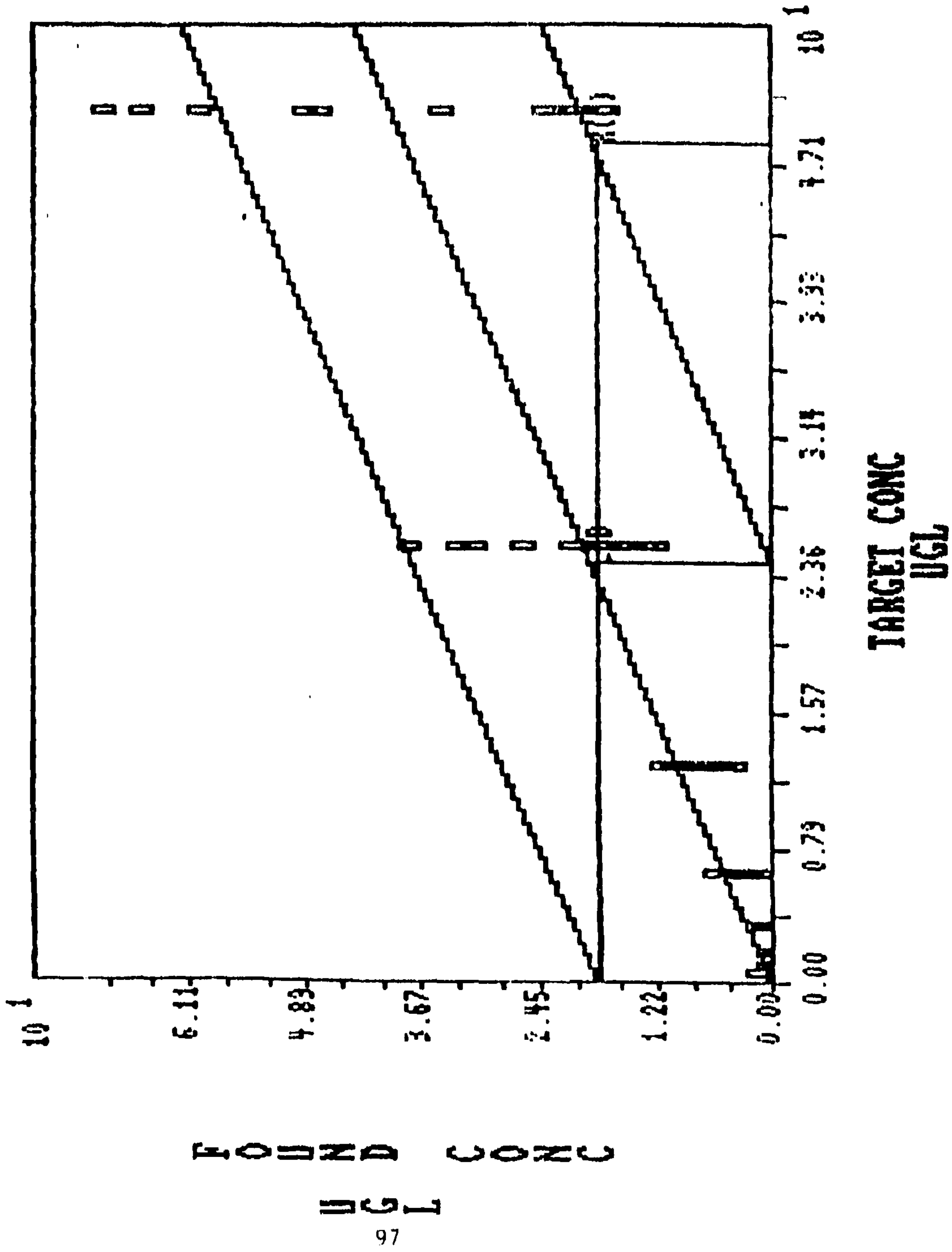


Figure F16
4-AM

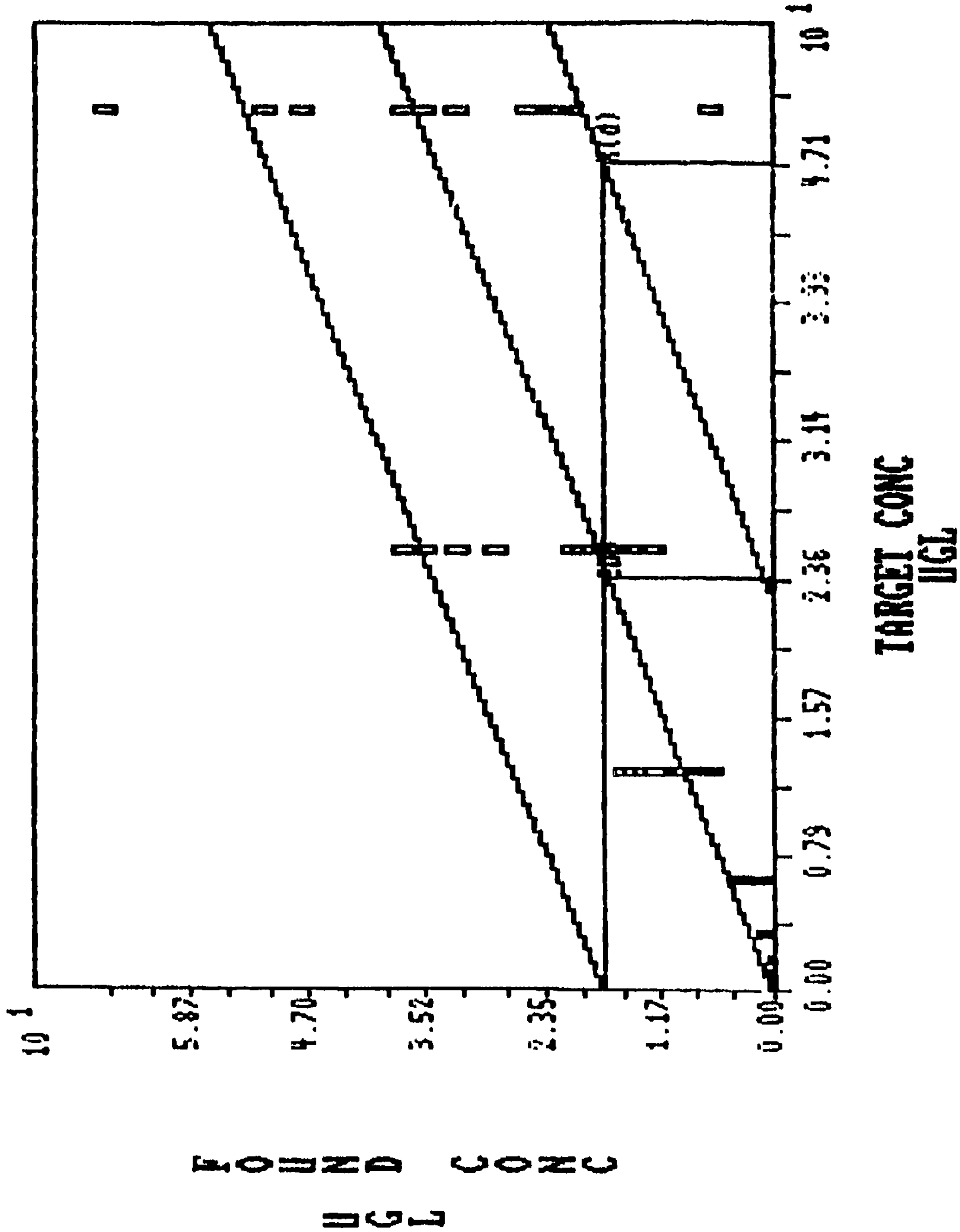


TABLE F9
CRITERION OF DETECTION FROM SOIL (mg/kg)

COMPOUNDS	CD
HMX	2.9
TNB	2.4
RDX	5.8
TNT	6.1
2,4 DNT	5.7
2,6 DNT	5.2
2-AM	15.4
4-AM	14.6

Table F10a

CERTIFICATION ANALYSIS

Report Date: 10/18/93

Method Name:	HMX	Units of Measure:	UGG
Method Number:		Laboratory:	MA
Compound:	HMX	Analysis Date	01/23/91
		Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- Y = (-0.00399784) + (1.017741420)X

- Model through the Origin - Y = (1.[illegible]141800)X

	Model with Intercept (SS)	(df)	(MS)	Model through the Origin (SS)	(df)	(MS)
Residual:	0.306303214	38	0.008060611	0.306750748	39	0.007865404
Total Error:	0.292517170	30	0.009750572	0.292517170	30	0.009750572
Lack of Fit:	0.013786044	8	0.001723255	0.014233578	9	0.001581509

LOF F-Ratio(F): 0.176733779 — LOF F-Ratio(F): 0.162196496

Critical 95% F: 2.27 — Critical 95% F: 2.21

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted   Calculated F: 0.055521102   Critical 95% F: 4.17

****

TABLE OF DATA POINTS   Targets: 10   Measures per Target: 4

	Target Value	Found Concentration			
1:	10	9.8800000	9.9800000	10.410000	10.370000
2:	5	4.9900000	5.0200000	5.2000000	5.2000000
3:	2.5000000	2.5000000	2.5100000	2.5800000	2.5600000
4:	1.2500000	1.2500000	1.4600000	1.2600000	1.3000000
5:	0.6300000	0.6400000	0.6200000	0.6300000	0.6400000
6:	0.3200000	0.3400000	0.3100000	0.2900000	0.2900000
7:	0.1600000	0.1600000	0.1600000	0.1400000	0.1600000
8:	0.0800000	0.0900000	0.0600000	0.0600000	0.0690000
9:	0.0400000	0.0500000	0.0100000	0.0240000	0.0270000
10:	0.0200000	0.0040000	0.0080000	0.0050000	0.0024000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F 10b

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name:	RADFORD	Units of Measure:	UGG
Method Number:	1	Laboratory:	MM
Compound:	HMX	Analysis Date	12/31/91
		Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- $Y = (-0.00458677) + (1.017921390)X$

- Model through the Origin - $Y = (1.017233440)X$

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	0.308793193	38	0.008126137	0.309382294	39	0.007932879
Total Error:	0.294318503	30	0.009810617	0.294318503	30	0.009810617
Lack of Fit:	0.014474690	8	0.001809336	0.015063791	9	0.001673755

LOF F-Ratio(F): 0.184426351 LOF F-Ratio(F): 0.170606456

Critical 95% F: 2.27 Critical 95% F: 2.21

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted Calculated F: 0.072494597 Critical 95% F: 4.17

****

TABLE OF DATA POINTS Targets: 10 Measures per Target: 4

	Target Value	Found Concentration			
1:	0.0200000	0.0040000	0.0080000	0.0050000	+2.40E-04
2:	0.0400000	0.0500000	0.0100000	0.0240000	0.0270000
3:	0.0800000	0.0900000	0.0600000	0.0600000	0.0690000
4:	0.1600000	0.1600000	0.1600000	0.1400000	0.1600000
5:	0.3200000	0.3400000	0.3100000	0.2900000	0.2900000
6:	0.6300000	0.6400000	0.6200000	0.6300000	0.6400000
7:	1.2500000	1.2500000	1.4600000	1.2600000	1.3000000
8:	2.5000000	2.5800000	2.5800000	2.5000000	2.5100000
9:	5	4.9900000	5.0200000	5.2000000	5.2000000
10:	10	9.8800000	9.9800000	10.410000	10.370000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name: MILAN
Method Number:
Compound: TNB

Units of Measure: UGG
Laboratory: MA
Analysis Date 01/23/91
Matrix: WA

ANALYSIS OF RESIDUAL VARIATIONS

	--- Model with Intercept ---			- Model through the Origin -		
	Y = (-0.04333250) + (1.013886250)X			Y = (1.007386980)X		
	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	0.293087156	38	0.007712820	0.345665012	39	0.008863205
Total Error:	0.217518860	30	0.007250629	0.217518860	30	0.007250629
Lack of Fit:	0.075568296	8	0.009446037	0.128146152	9	0.014238461

LOF F-Ratio(F): 1.302788687 LOF F-Ratio(F): 1.963755419
Critical 95% F: 2.27 Critical 95% F: 2.21

ZERO INTERCEPT HYPOTHESIS

**Zero Intercept Rejected Calculated F: 6.816943312 Critical 95% F: 4.17

****

TABLE OF DATA POINTS Targets: 10 Measures per Target: 4

	Target Value	Found Concentration			
1:	10	10.310000	10.360000	9.9700000	9.9700000
2:	5	4.8600000	4.9300000	5.0100000	5
3:	2.5000000	2.4200000	2.3200000	2.4900000	2.4800000
4:	1.2500000	1.0400000	1.2400000	1.2400000	1.2600000
5:	0.6300000	0.5900000	0.5800000	0.6100000	0.6300000
6:	0.3200000	0.2100000	0.1900000	0.3200000	0.3100000
7:	0.1600000	0.1600000	0.1500000	0.1600000	0.1600000
8:	0.0800000	0.0420000	0.0350000	0.0740000	0.0860000
9:	0.0400000	0.0500000	0.0100000	0.0240000	0.0270000
10:	0.0200000	0.0092000	0.0074000	0.0180000	0.0250000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F 11b

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name:	RADFORD	Units of Measure:	UGG
Method Number:	1	Laboratory:	MM
Compound:	TNB	Analysis Date	12/31/91
		Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- $Y = (-0.04162067) + (1.014855330)X$

- Model through the Origin - $Y = (1.008612820)X$

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	0.257655922	38	0.006780419	0.306161703	39	0.007850300
Total Error:	0.204409860	30	0.006813662	0.204409860	30	0.006813662
Lack of Fit:	0.053246062	8	0.006655758	0.101751843	9	0.011305760

LOF F-Ratio(F): 0.976825347 LOF F-Ratio(F): 1.659278129

Critical 95% F: 2.27 Critical 95% F: 2.21

ZERO INTERCEPT HYPOTHESIS

**Zero Intercept Rejected Calculated F: 7.153802884 Critical 95% F: 4.17

****

TABLE OF DATA POINTS Targets: 10 Measures per Target: 4

	Target Value	Found Concentration			
1:	0.0200000	0.0092000	0.0074000	0.0180000	0.0250000
2:	0.0400000	0.0410000	0.0370000	0.0200000	0.0240000
3:	0.0800000	0.0860000	0.0740000	0.0350000	0.0420000
4:	0.1600000	0.0860000	0.0890000	0.1600000	0.1600000
5:	0.3200000	0.2100000	0.1900000	0.3200000	0.3100000
6:	0.6300000	0.6300000	0.6100000	0.5800000	0.5900000
7:	1.2500000	1.0400000	1.2400000	1.2400000	1.2600000
8:	2.5000000	2.4800000	2.4900000	2.5100000	2.5000000
9:	5	4.8600000	4.9300000	5.0100000	5
10:	10	9.9700000	9.9700000	10.310000	10.360000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

CERTIFICATION ANALYSIS   Report Date: 10/19/93

Method Name:	RDX	Units of Measure:	UGG
Method Number:		Laboratory:	MA
Compound:	RDX	Analysis Date	01/23/91
		Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- Y = (-0.01050523) + (1.008102610)X

- Model through the Origin - Y = (1.006526980)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	0.059094913	38	0.001555129	0.062185112	39	0.001594490
Total Error:	0.035115500	30	0.001170517	0.035115500	30	0.001170517
Lack of Fit:	0.023979413	8	0.002997427	0.027069612	9	0.003007735

Model with Intercept	Model through the Origin
LOF F-Ratio(F): 2.560772294	LOF F-Ratio(F): 2.569578676
Critical 95% F: 2.27	Critical 95% F: 2.21
Data Not Linear	Data Not Linear

ZERO INTERCEPT HYPOTHESIS

** Models not linear. Do not test Zero Intercept hypothesis.

Diagnose and correct analytical system before continuing.

****

TABLE OF DATA POINTS   Targets: 10   Measures per Target: 4

	Target Value	Found Concentration			
1:	10	10.060000	10.150000	10.150000	10.060000
2:	5	4.8900000	4.9400000	5.0500000	5.0200000
3:	2.5000000	2.4400000	2.4700000	2.5100000	2.5200000
4:	1.2500000	1.2100000	1.2300000	1.2200000	1.2900000
5:	0.6300000	0.6300000	0.6100000	0.6200000	0.6200000
6:	0.3200000	0.3400000	0.3300000	0.3400000	0.3100000
7:	0.1600000	0.1600000	0.1500000	0.1700000	0.1900000
8:	0.0800000	0.0790000	0.0900000	0.0880000	0.1000000
9:	0.0400000	0.0230000	0.0310000	0.0310000	0.0500000
10:	0.0200000	0.0320000	0.0200000	0.0020000	0.0020000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F 12b

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name:	RADFORD	Units of Measure:	UGG
Method Number:	1	Laboratory:	MM
Compound:	RDX	Analysis Date	12/31/91
		Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

	--- Model with Intercept ---			- Model through the Origin -		
	Y = (0.013858142) + (1.001916230)X			Y = (1.003992260)X		
	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	0.373006260	34	0.010970772	0.377621272	35	0.010789179
Total Error:	0.226222000	27	0.008378593	0.226222000	27	0.008378593
Lack of Fit:	0.146784260	7	0.020969180	0.151399272	8	0.018924909

LOF F-Ratio(F): 2.502709109 LOF F-Ratio(F): 2.258721711

Critical 95% F: 2.37 Critical 95% F: 2.31

Data Not Linear

ZERO INTERCEPT HYPOTHESIS

** Intercept model not linear. Do not test Zero Intercept hypothesis.

Diagnose and correct analytical system before continuing.

****

TABLE OF DATA POINTS Targets: 9 Measures per Target: 4

	Target Value	Found Concentration			
1:	0.0400000	0	0	0.0270000	0.0270000
2:	0.0800000	0	0.0580000	0.0600000	0.0600000
3:	0.1600000	0.1400000	0.2100000	0.1900000	0.1900000
4:	0.3200000	0.2600000	0.3900000	0.1900000	0.3400000
5:	0.6250000	0.6100000	0.6300000	0.5800000	0.5800000
6:	1.2500000	1.5000000	1.4000000	1.3000000	1.1000000
7:	2.5000000	2.6000000	2.5000000	2.8000000	2.8000000
8:	5	5.1000000	5.1000000	4.9000000	4.9000000
9:	10	10	10.010000	10	10

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F 13a

CERTIFICATION ANALYSIS

Report Date: 10/19/93

Method Name: TNT
Method Number:
Compound: TNT

Units of Measure: UGG
Laboratory: MA
Analysis Date 01/23/91
Matrix: WA

ANALYSIS OF RESIDUAL VARIATION

--- Model with Intercept --- Y = (-0.01813630) + (1.007155650)X

- Model through the Origin - Y = (1.004435460)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	0.113801306	38	0.002994771	0.123011588	39	0.003154143
Total Error:	0.102973750	30	0.003432458	0.102973750	30	0.003432458
Lack of Fit:	0.010827556	8	0.001353444	0.020037838	9	0.002226426

LOF F-Ratio(F): 0.394307627 LOF F-Ratio(F): 0.648639030
Critical 95% F: 2.27 Critical 95% F: 2.21

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted   Calculated F: 3.075454301   Critical 95% F: 4.17

****

TABLE OF DATA POINTS   Targets: 10   Measures per Target: 4

	Target Value	Found Concentration			
1:	10	9.9300000	10.110000	10.180000	10.080000
2:	5	4.8600000	4.8900000	5.1100000	5.0700000
3:	2.5000000	2.4600000	2.4400000	2.5200000	2.5500000
4:	1.2500000	1.1500000	1.2000000	1.2300000	1.2900000
5:	0.6300000	0.6200000	0.5900000	0.6400000	0.6200000
6:	0.3200000	0.3200000	0.2900000	0.3100000	0.3400000
7:	0.1600000	0.1400000	0.1400000	0.1600000	0.1800000
8:	0.0800000	0.0640000	0.0660000	0.0740000	0.0840000
9:	0.0400000	0.0280000	0.0280000	0.0270000	0.0260000
10:	0.0200000	0.0020000	0.0020000	0.0140000	0.0120000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F 13b

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name:	RADFORD	Units of Measure:	UGG
Method Number:	1	Laboratory:	MM
Compound:	TNT	Analysis Date	12/31/91
		Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- $Y = (-0.01801080) + (1.007417900)X$

- Model through the Origin - $Y = (1.004716530)X$

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	0.110208263	38	0.002900217	0.119291521	39	0.003058757
Total Error:	0.101346750	30	0.003378225	0.101346750	30	0.003378225
Lack of Fit:	0.008861513	8	0.001107689	0.017944771	9	0.001993863

LOF F-Ratio(F): 0.327890867 LOF F-Ratio(F): 0.590210375

Critical 95% F: 2.27 Critical 95% F: 2.21

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted Calculated F: 3.131923094 Critical 95% F: 4.17

****

TABLE OF DATA POINTS Targets: 10 Measures per Target: 4

	Target Value	Found Concentration			
1:	0.0200000	0	0	0.0140000	0.0120000
2:	0.0400000	0.0260000	0.0270000	0.0280000	0.0280000
3:	0.0800000	0.0640000	0.0660000	0.0740000	0.0840000
4:	0.1600000	0.1400000	0.1400000	0.1600000	0.1800000
5:	0.3200000	0.3400000	0.3100000	0.3200000	0.2900000
6:	0.6300000	0.6200000	0.5900000	0.6400000	0.6200000
7:	1.2500000	1.2900000	1.2300000	1.1500000	1.2000000
8:	2.5000000	2.4600000	2.4400000	2.5200000	2.5500000
9:	5	5.0700000	5.1100000	4.8400000	4.9400000
10:	10	9.9300000	10.110000	10.180000	10.080000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

CERTIFICATION ANALYSIS

Report Date: 10/18/93

Method Name:	2,4	Units of Measure:	UGG
Method Number:		Laboratory:	MA
Compound:	2,4	Analysis Date	01/23/91
		Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- $Y = (-0.02530612) + (1.025863060)X$

- Model through the Origin - $Y = (1.022067500)X$

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	0.405071561	38	0.010659778	0.423003471	39	0.010846243
Total Error:	0.360487280	30	0.012016243	0.360487280	30	0.012016243
Lack of Fit:	0.044584281	8	0.005573035	0.062516191	9	0.006946243

LOF F-Ratio(F): 0.463791826 LOF F-Ratio(F): 0.578071169
Critical 95% F: 2.27 Critical 95% F: 2.21

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted Calculated F: 1.682202963 Critical 95% F: 4.17

****

TABLE OF DATA POINTS Targets: 10 Measures per Target: 4

	Target Value	Found Concentration			
1:	10	10.090000	10.110000	10.560000	10.360000
2:	5	4.8400000	4.8500000	5.2500000	5.2000000
3:	2.5000000	2.3700000	2.3900000	2.5700000	2.6300000
4:	1 2500000	1.2000000	1.2000000	1.2600000	1.3100000
5:	0.6300000	0.6200000	0.5900000	0.6500000	0.6700000
6:	0.3200000	0.3400000	0.3400000	0.3100000	0.3100000
7:	0.1600000	0.1500000	0.1500000	0.1600000	0.1900000
8:	0.0800000	0.0730000	0.0720000	0.0800000	0.0730000
9:	0.0400000	0.0220000	0.0140000	0.0088000	0.0360000
10:	0.0200000	0.0020000	0.0020000	0.0020000	0.0020000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F 14b

CERTIFICATION ANALYSIS — Report Date: 10/12/93

Method Name:	RADFORD	Units of Measure:	UGG
Method Number:	1	Laboratory:	MM
Compound:	2-4DNT	Analysis Date	12/31/91
		Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- : Y = (-0.02459154) + (1.023768270)X

- Model through the Origin - : Y = (1.020079880)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	0.460537936	38	0.012119419	0.477471436	39	0.012242857
Total Error:	0.416563030	30	0.013885434	0.416563030	30	0.013885434
Lack of Fit:	0.043974906	8	0.005496863	0.060908406	9	0.006767601

LOF F-Ratio(F): 0.395872619 — LOF F-Ratio(F): 0.487388475

Critical 95% F: 2.27 — Critical 95% F: 2.21

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted — Calculated F: 1.397220402 — Critical 95% F: 4.17

****

TABLE OF DATA POINTS — Targets: 10 — Measures per Target: 4

	Target Value	Found Concentration			
1:	0.0200000	0	0	0	0
2:	0.0400000	0.0220000	0.0140000	0.0088000	0.0360000
3:	0.0800000	0.0730000	0.0800000	0.0720000	0.0730000
4:	0.1600000	0.1500000	0.1500000	0.1600000	0.1900000
5:	0.3200000	0.3100000	0.3100000	0.3400000	0.3400000
6:	0.6300000	0.6200000	0.5900000	0.6500000	0.6700000
7:	1.2500000	1.2000000	1.2000000	1.2600000	1.3100000
8:	2.5000000	2.3700000	2.3900000	2.5700000	2.6300000
9:	5	4.8400000	4.8000000	5.2500000	5.2000000
10:	10	10.009000	10.110000	10.560000	10.360000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

CERTIFICATION ANALYSIS

Report Date: 10/18/93

Method Name:	2,6	Units of Measure:	UGG
Method Number:		Laboratory:	MA
Compound:	2,6	Analysis Date	01/23/91
		Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- Y = (-0.03122974) + (1.047214870)X

- Model through the Origin - Y = (1.042530850)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	1.981234090	38	0.052137739	2.008543500	39	0.051501115
Total Error:	1.940400000	30	0.064680000	1.940400000	30	0.064680000
Lack of Fit:	0.040834090	8	0.005104261	0.068143500	9	0.007571500

LOF F-Ratio(F): 0.078915604 LOF F-Ratio(F): 0.117060915
Critical 95% F: 2.27 Critical 95% F: 2.21

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Accepted Calculated F: 0.523793521 Critical 95% F: 4.17

****

TABLE OF DATA POINTS Targets: 10 Measures per Target: 4

	Target Value	Found Concentration			
1:	10	10.140000	9.8100000	11.240000	10.730000
2:	5	4.7800000	4.8000000	5.5700000	5.4600000
3:	2.5000000	2.3200000	2.3200000	2.6800000	2.7700000
4:	1.2500000	1.3800000	1.2900000	1.2600000	1.2100000
5:	0.6300000	0.6000000	0.5900000	0.6800000	0.7100000
6:	0.3200000	0.3200000	0.2800000	0.3500000	0.3700000
7:	0.1600000	0.1700000	0.2100000	0.1400000	0.1200000
8:	0.0800000	0.0590000	0.0460000	0.0800000	0.0430000
9:	0.0200000	0	0	0	0
10:	0.0400000	0	0	0	0

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F 15b

CERTIFICATION ANALYSIS

Report Date: 10/12/93

....

Method Name:	RADFORD	Units of Measure:	UGG
Method Number:	1	Laboratory:	MM
Compound:	2-6DNT	Analysis Date	12/31/91
		Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- Y = (-0.03122974) + (1.047214870)X

- Model through the Origin - Y = (1.042530850)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	1.981234090	38	0.052137739	2.008543500	39	0.051501115
Total Error:	1.940400000	30	0.064680000	1.940400000	30	0.064680000
Lack of Fit:	0.040834090	8	0.005104261	0.068143500	9	0.007571500

LOF F-Ratio(F): 0.078915604 LOF F-Ratio(F): 0.117060915

Critical 95% F: 2.27 Critical 95% F: 2.21

ZERO INTERCEPT HYPOTHESIS

....

Zero Intercept Accepted Calculated F: 0.523793521 Critical 95% F: 4.17

....

****

TABLE OF DATA POINTS Targets: 10 Measures per Target: 4

	Target Value	Found Concentration			
1:	0.0200000	0	0	0	0
2:	0.0400000	0	0	0	0
3:	0.0800000	0.0460000	0.0590000	0.0800000	0.0430000
4:	0.1600000	0.1200000	0.1400000	0.1700000	0.2100000
5:	0.3200000	0.3200000	0.2800000	0.3500000	0.3700000
6:	0.6300000	0.7100000	0.6800000	0.5900000	0.6000000
7:	1.2500000	1.2600000	1.2100000	1.2900000	1.3800000
8:	2.5000000	2.7700000	2.6800000	2.3200000	2.3200000
9:	5	4.7800000	4.8000000	5.5700000	5.4600000
10:	10	10.140000	9.8100000	11.240000	10.730000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

CERTIFICATION ANALYSIS

Report Date: 10/18/93

Method Name:	2AM	Units of Measure:	UGG
Method Number:		Laboratory:	MA
Compound:	2AM	Analysis Date	01/23/91
		Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

	--- Model with Intercept ---			- Model through the Origin -		
	Y = (-0.04092383) + (1.009736910)X			Y = (1.003598910)X		
	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	0.263036377	38	0.006922010	0.309931526	39	0.007946962
Total Error:	0.218409500	30	0.007280317	0.218409500	30	0.007280317
Lack of Fit:	0.044626877	8	0.005578360	0.091522026	9	0.010169114

LOF F-Ratio(F): 0.766224861 LOF F-Ratio(F): 1.396795561
Critical 95% F: 2.27 Critical 95% F: 2.21

ZERO INTERCEPT HYPOTHESIS

**Zero Intercept Rejected Calculated F: 6.774787892 Critical 95% F: 4.17

****

TABLE OF DATA POINTS Targets: 10 Measures per Target: 4

	Target Value	Found Concentration			
1:	10	9.9800000	10.030000	10.430000	9.9500000
2:	5	4.8300000	5.0500000	4.9200000	5.0400000
3:	2.5000000	2.3800000	2.4100000	2.4900000	2.4100000
4:	1.2500000	1.1900000	1.1700000	1.2100000	1.1700000
5:	0.6300000	0.6200000	0.5700000	0.5600000	0.7100000
6:	0.3200000	0.2500000	0.3300000	0.3400000	0.3300000
7:	0.1600000	0.1400000	0.1800000	0.1400000	0.0750000
8:	0.0800000	0.0430000	0.0800000	0.0230000	0.0560000
9:	0.0400000	0.0190000	0.0020000	0.0040000	0.0020000
10:	0.0200000	0.0020000	0.0020000	0.0020000	0.0020000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name:	RADFORD	Units of Measure:	UGG
Method Number:	1	Laboratory:	MM
Compound:	2AMDNT	Analysis Date	12/31/91
		Matrix:	WA

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- : Y = (-0.04248105) + (1.009965530)X

- Model through the Origin - : Y = (1.003593960)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	0.262130576	38	0.006898173	0.312662515	39	0.008016988
Total Error:	0.218400500	30	0.007280017	0.218400500	30	0.007280017
Lack of Fit:	0.043730076	8	0.005466260	0.094262015	9	0.010473557

LOF F-Ratio(F): 0.750858102 LOF F-Ratio(F): 1.438672149
Critical 95% F: 2.27 Critical 95% F: 2.21

ZERO INTERCEPT HYPOTHESIS

**Zero Intercept Rejected Calculated F: 7.325409005 Critical 95% F: 4.17

****

TABLE OF DATA POINTS Targets: 10 Measures per Target: 4

	Target Value	Found Concentration			
1:	0.0200000	0	0	0	0
2:	0.0400000	0.0190000	0	0	0
3:	0.0800000	0.0560000	0.0230000	0.0230000	0.0710000
4:	0.1600000	0.0760000	0.1400000	0.1400000	0.1800000
5:	0.3200000	0.3400000	0.3300000	0.3300000	0.2500000
6:	0.6300000	0.6200000	0.5700000	0.5600000	0.7100000
7:	1.2500000	1.1900000	1.1700000	1.1700000	1.2100000
8:	2.5000000	2.3800000	2.4100000	2.4100000	2.4900000
9:	5	4.8300000	5.0500000	5.0400000	4.9200000
10:	10	9.9800000	10.030000	10.430000	9.9500000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

CERTIFICATION ANALYSIS

Report Date: 10/18/93

Method Name: MILAN
Method Number:
Compound: 4AMDNT

Units of Measure: UGG
Laboratory: MA
Analysis Date 01/23/91
Matrix: WA

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- $Y = (-0.05365346) + (1.006851730)X$

- Model through the Origin - $Y = (0.998804462)X$

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	0.181320988	38	0.004771605	0.261927629	39	0.006716093
Total Error:	0.138595000	30	0.004619833	0.138595000	30	0.004619833
Lack of Fit:	0.042725988	8	0.005340748	0.123332629	9	0.013703625

LOF F-Ratio(F): 1.156047873
Critical 95% F: 2.27

LOF F-Ratio(F): 2.966259702
Critical 95% F: 2.21
Data Not Linear

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Rejected Calculated F: 16.89298295 Critical 95% F: 4.17
Model not linear through Origin

****

TABLE OF DATA POINTS

Targets: 10 Measures per Target: 4

	Target Value	Found Concentration			
1:	10	10.030000	10	10.160000	9.9900000
2:	5	4.8700000	4.8500000	4.9100000	5.1000000
3:	2.5000000	2.3800000	2.4000000	2.4900000	2.4900000
4:	1.2500000	1.2100000	1.1600000	1.2200000	1.2100000
5:	0.6300000	0.6000000	0.6100000	0.5800000	0.6500000
6:	0.3200000	0.3500000	0.3200000	0.2100000	0.0360000
7:	0.1600000	0.0600000	0.0650000	0.1100000	0.0810000
8:	0.0800000	0.0210000	0.0320000	0.0360000	0.0210000
9:	0.0400000	0.0830000	0.0360000	0.0210000	0.0020000
10:	0.0200000	0.0020000	0.0020000	0.0020000	0.0020000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

Table F 17b

CERTIFICATION ANALYSIS

Report Date: 10/12/93

Method Name: RADFORD
Method Number: 1
Compound: 4AMDNT

Units of Measure: UGG
Laboratory: MM
Analysis Date 12/31/91
Matrix: WA

ANALYSIS OF RESIDUAL VARIATIONS

--- Model with Intercept --- Y = (-0.05243419) + (1.006758340)X

- Model through the Origin - Y = (0.998893951)X

	(SS)	(df)	(MS)	(SS)	(df)	(MS)
Residual:	0.134476662	38	0.003538860	0.211461379	39	0.005422087
Total Error:	0.106517568	30	0.003550586	0.106517568	30	0.003550586
Lack of Fit:	0.027959094	8	0.003494887	0.104943811	9	0.011660423

LOF F-Ratio(F): 0.984312771
Critical 95% F: 2.27

LOF F-Ratio(F): 3.284084587
Critical 95% F: 2.21
Data Not Linear

ZERO INTERCEPT HYPOTHESIS

Zero Intercept Rejected Calculated F: 21.75410367 Critical 95% F: 4.17
Model not linear through Origin

****

TABLE OF DATA POINTS Targets: 10 Measures per Target: 4

	Target Value	Found Concentration			
1:	0.0200000	0	0	0	0
2:	0.0400000	0.0083000	0	0	0.0190000
3:	0.0800000	0.0210000	0.0360000	0.0320000	0.0210000
4:	0.1600000	0.0650000	0.0600000	0.1100000	0.0810000
5:	0.3200000	0.1200000	0.2900000	0.3200000	0.3500000
6:	0.6300000	0.6100000	0.6000000	0.5800000	0.6500000
7:	1.2500000	1.2200000	1.2100000	1.1600000	1.2100000
8:	2.5000000	2.3800000	2.4000000	2.4900000	2.4900000
9:	5	4.8700000	4.8500000	5.1000000	4.9100000
10:	10	10.030000	10	10.160000	9.9900000

*** END OF CERTIFICATION LACK OF FIT DATA TABLE ***

FIGURE 17a
HMX

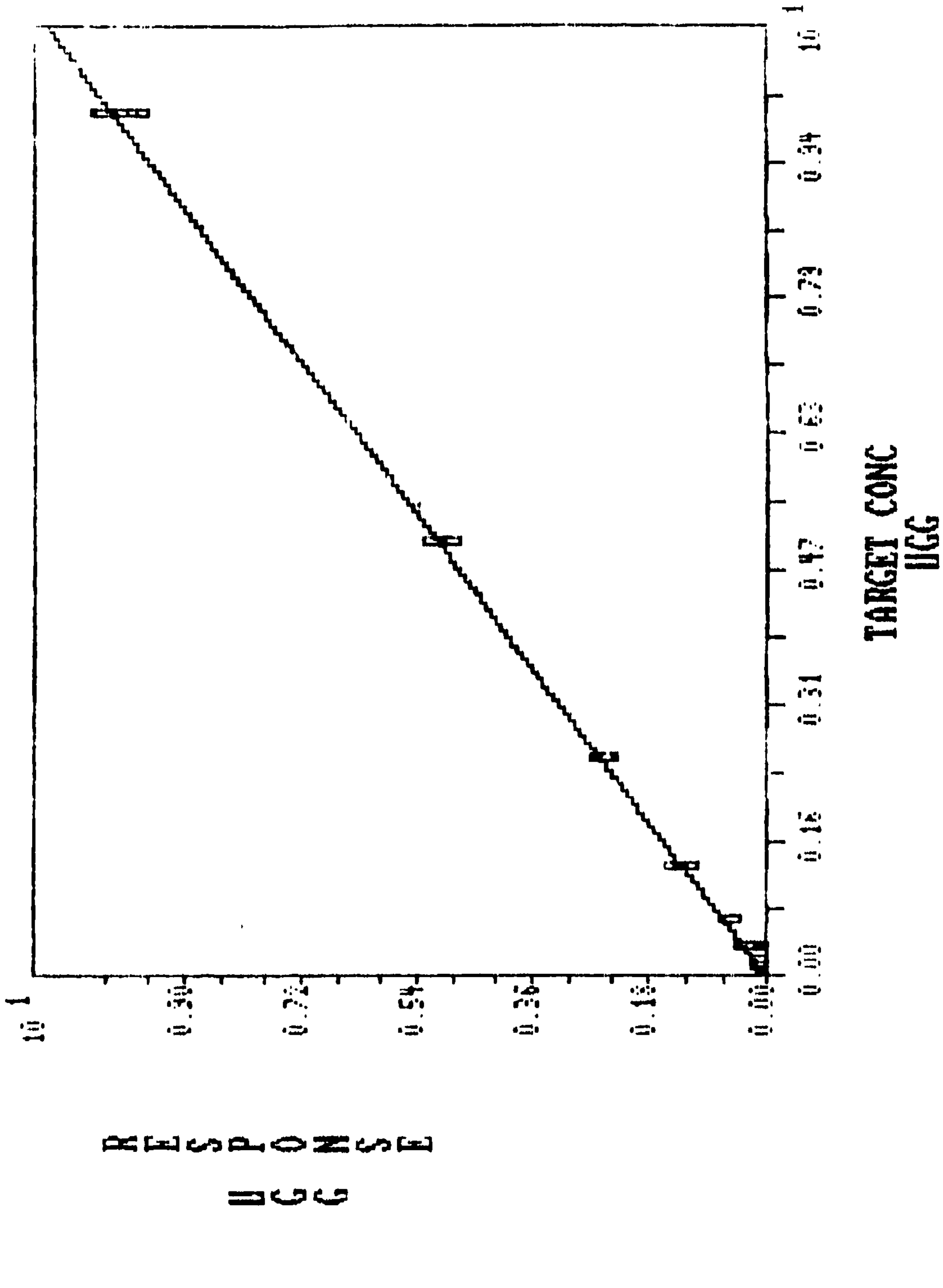


FIGURE F 17b

HMX

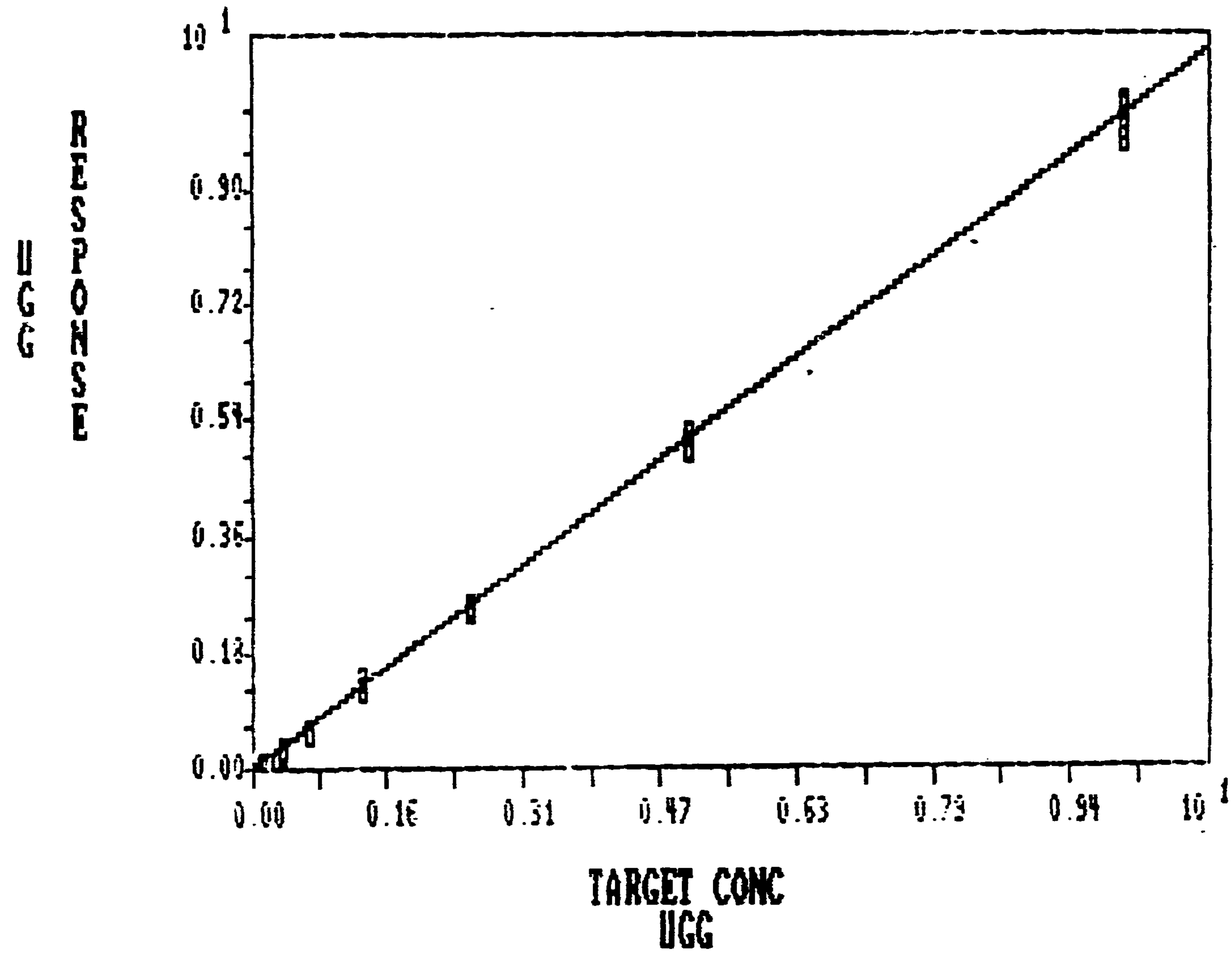


FIGURE F 18a

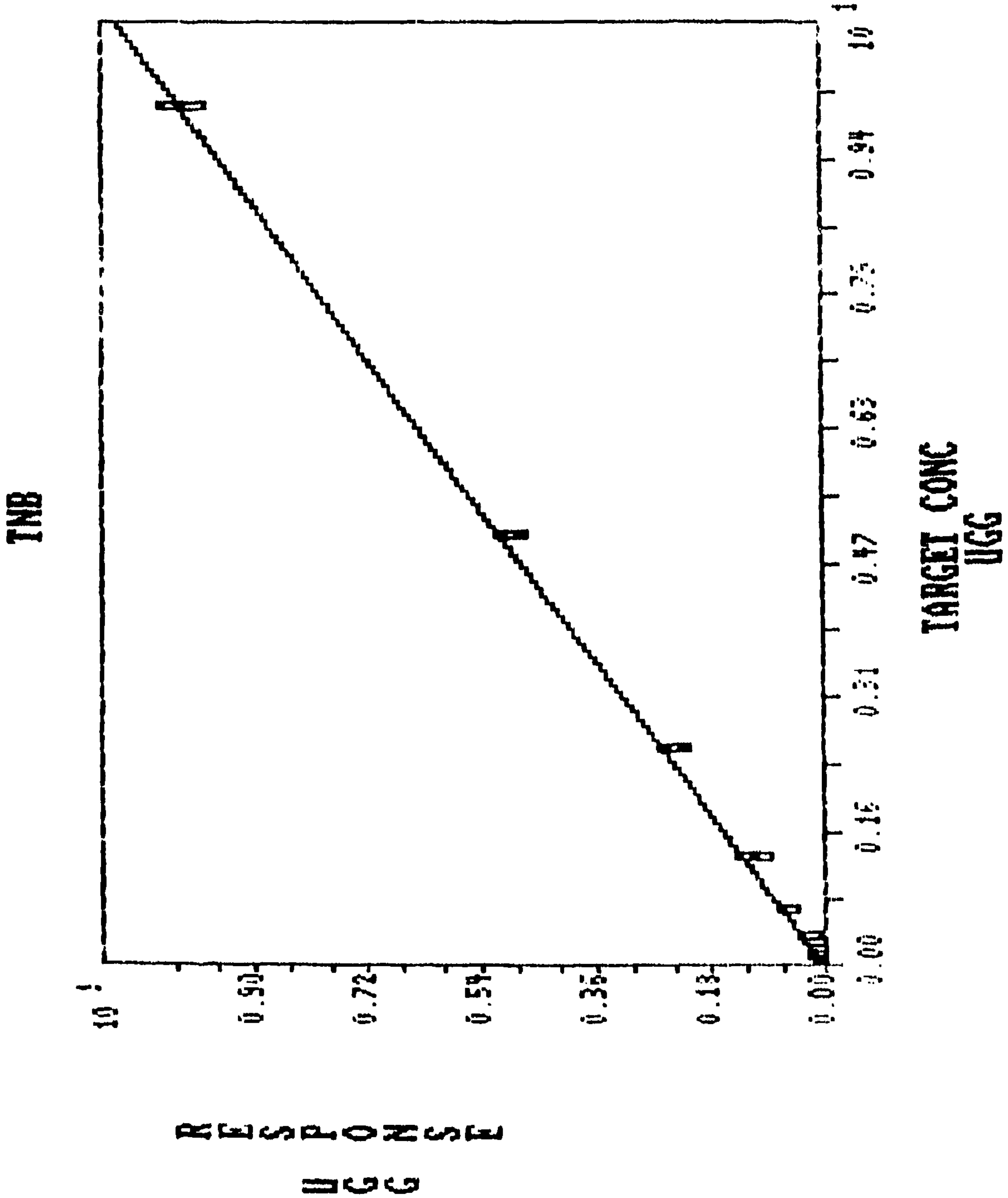

TNB
TARGET CONC
UGG
RESPONSE
UGG
0.00
0.16
0.31
0.47
0.63
0.94
0.18
0.36
0.54
0.72
0.90

FIGURE F 18b

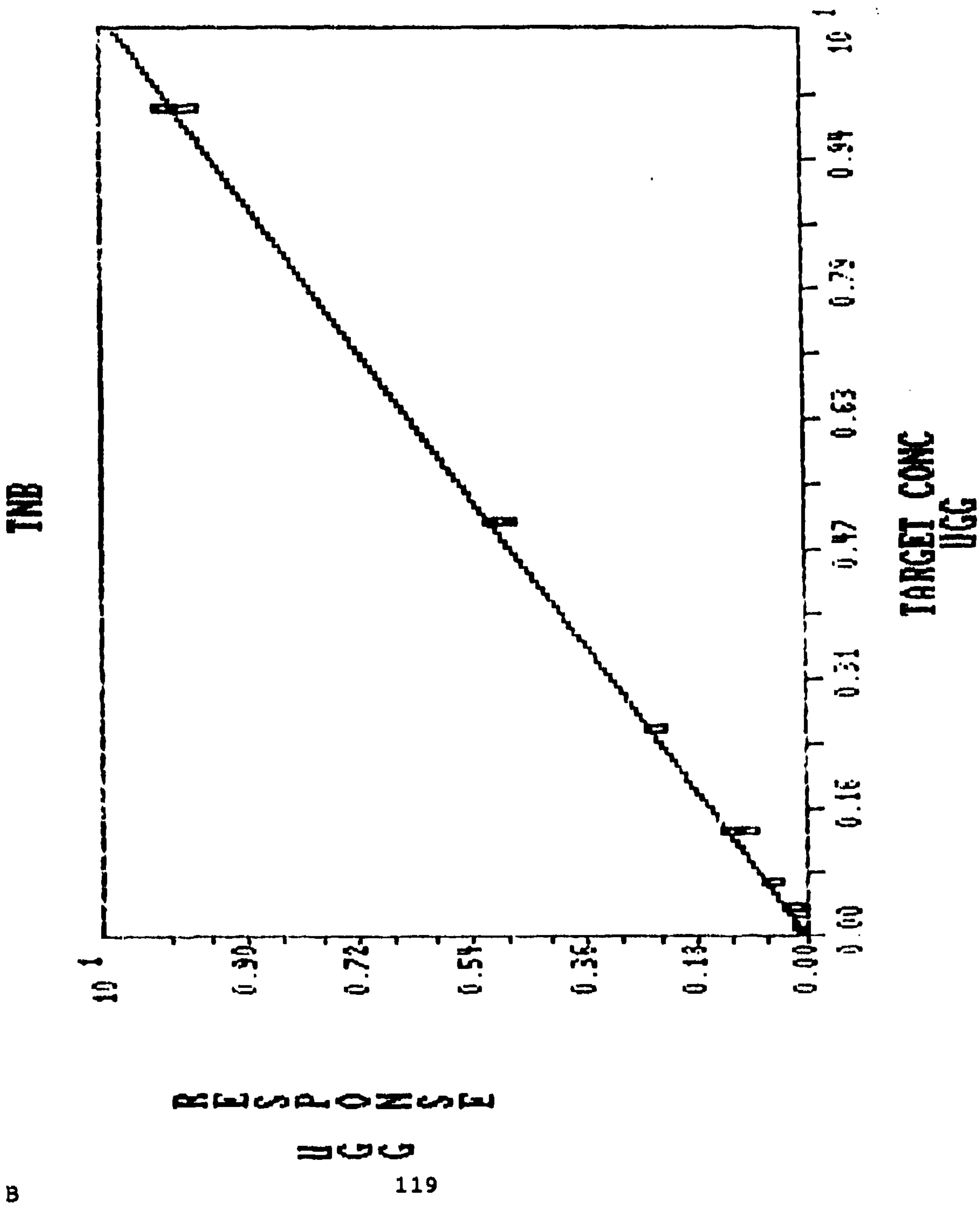

TNB
TARGET CONC
UGG
RESPONSE
UGG
0.00
0.16
0.31
0.47
0.63
0.94
0.18
0.36
0.54
0.72
0.90

FIGURE F 19a

RDX

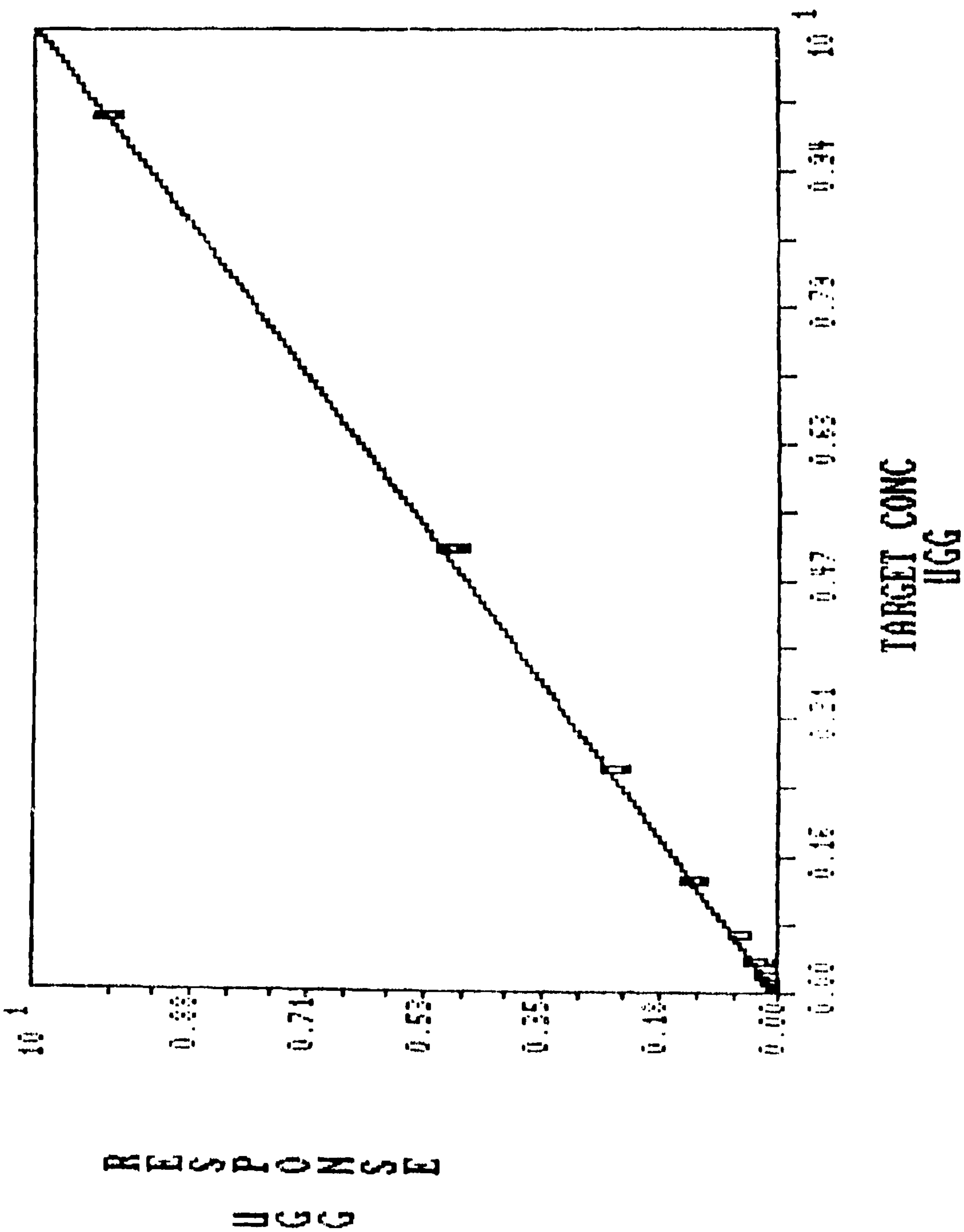


FIGURE F 19b

RDX

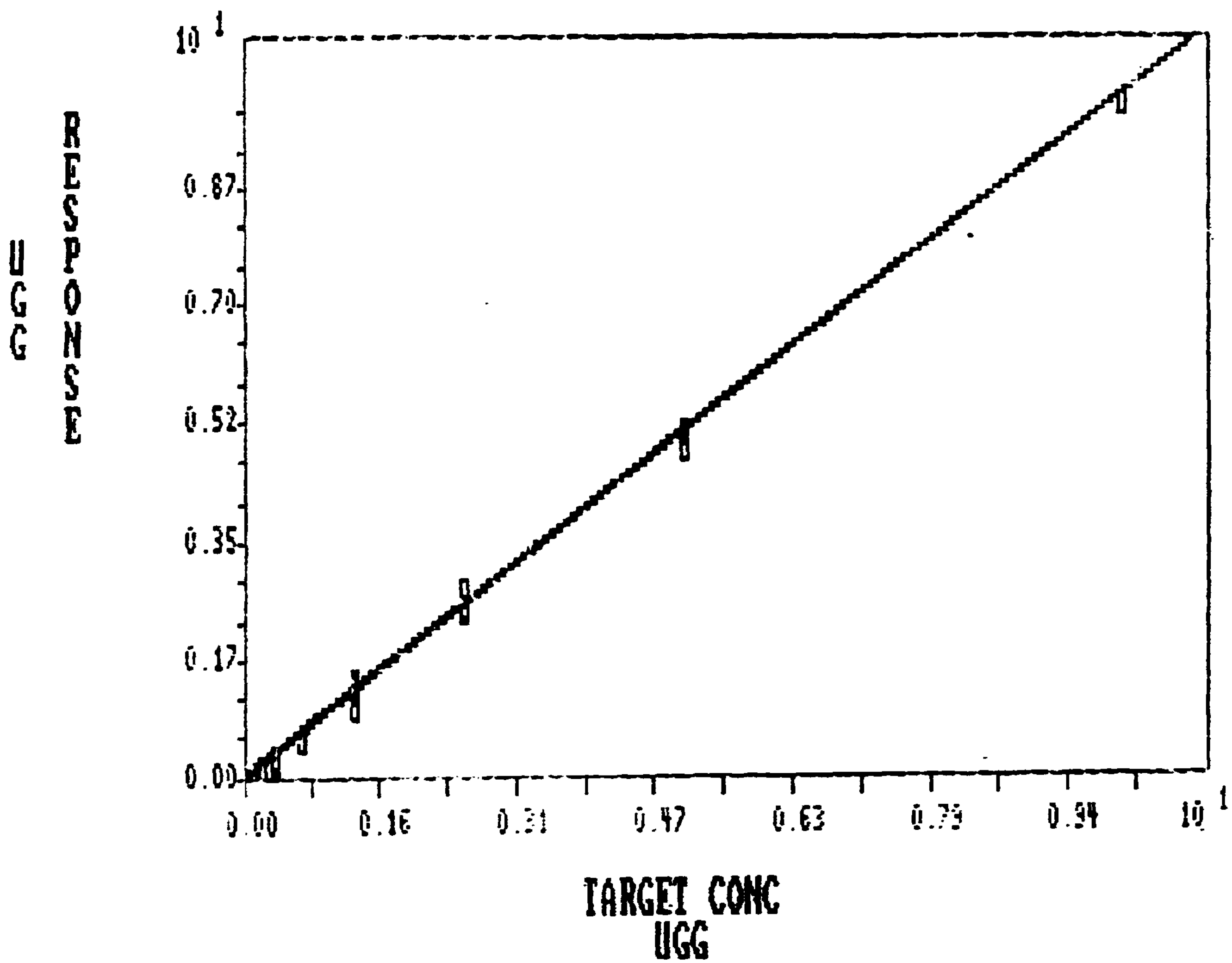


FIGURE F 20a

TNT

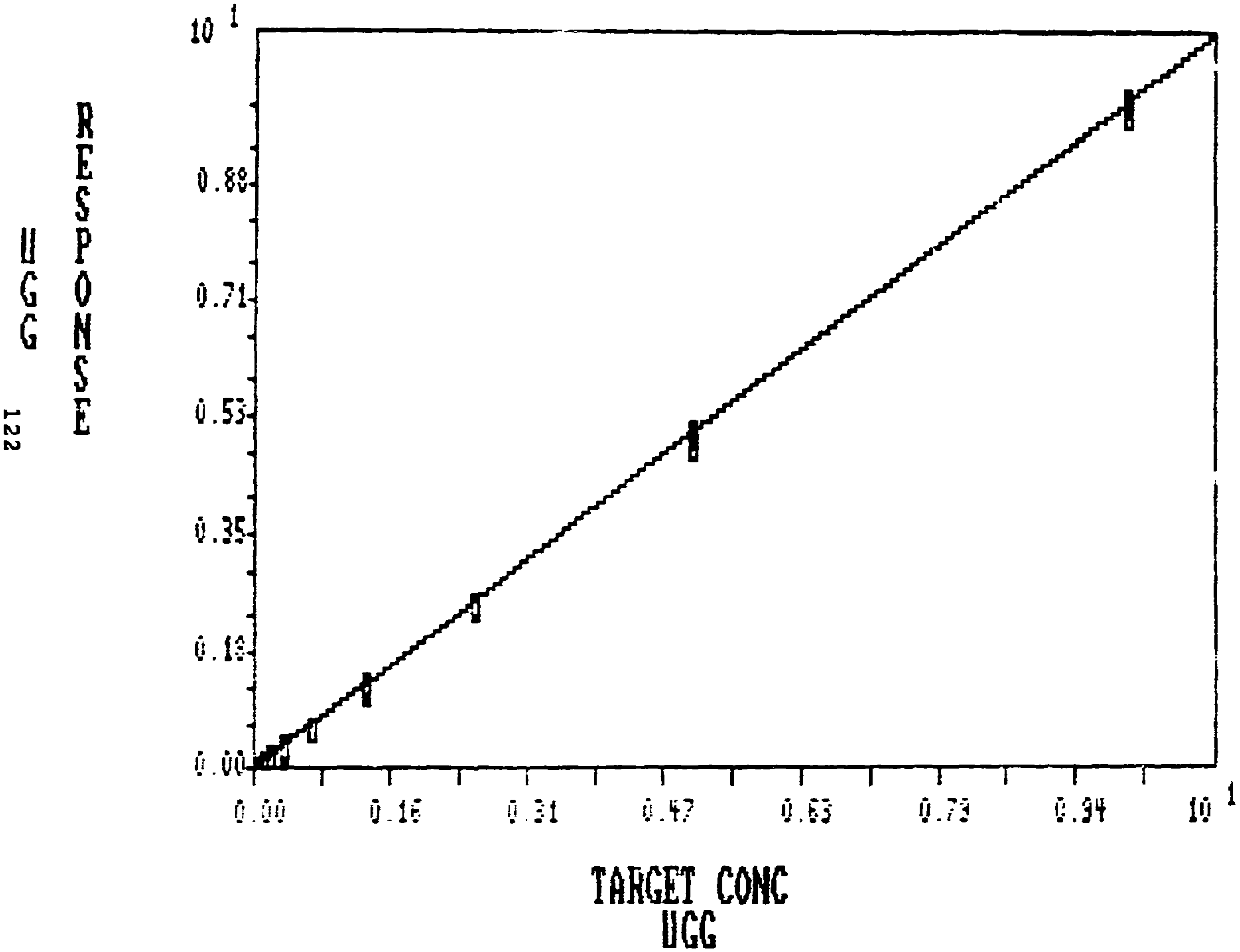


FIGURE F 20b

TNT

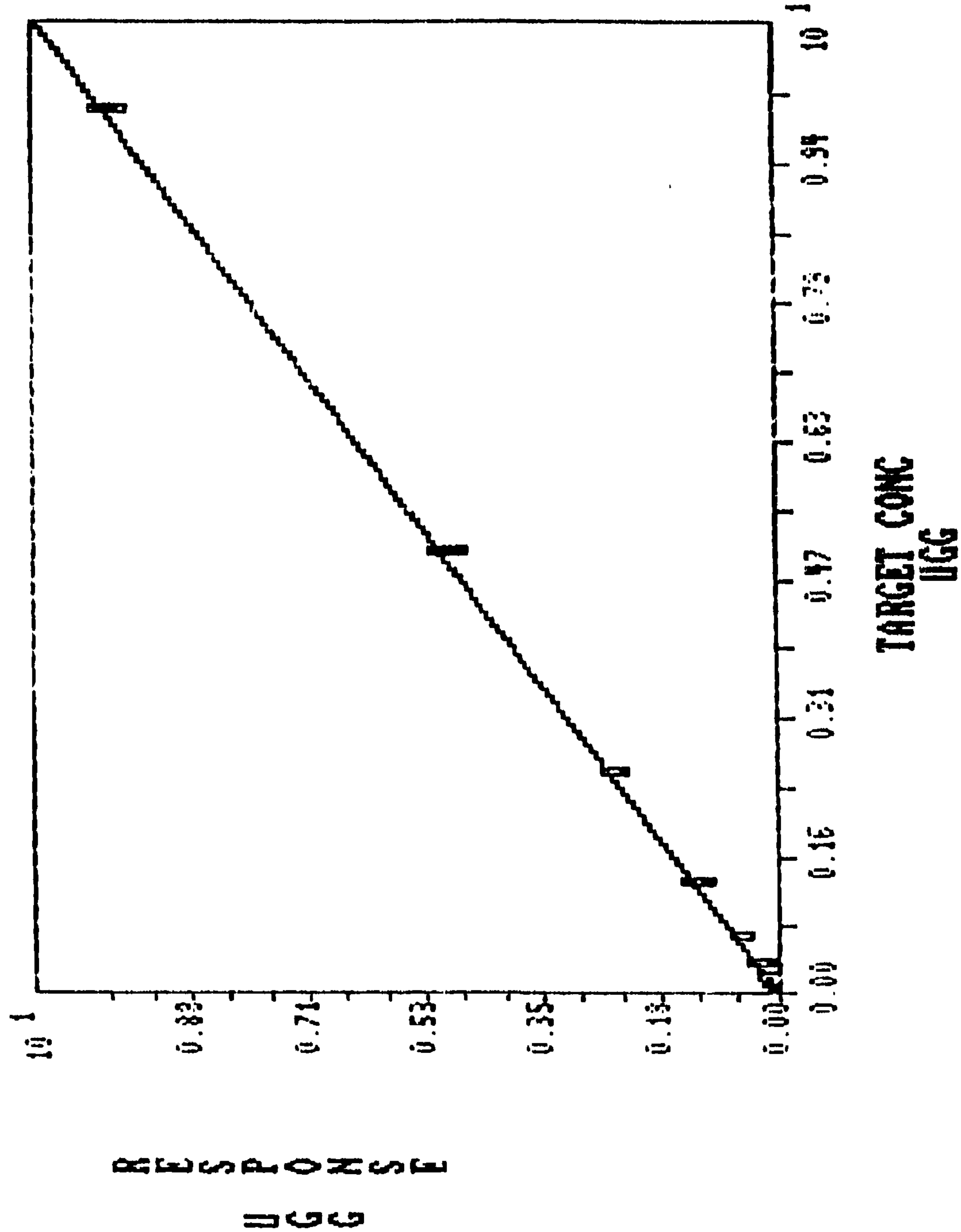


FIGURE F 21a

2,4

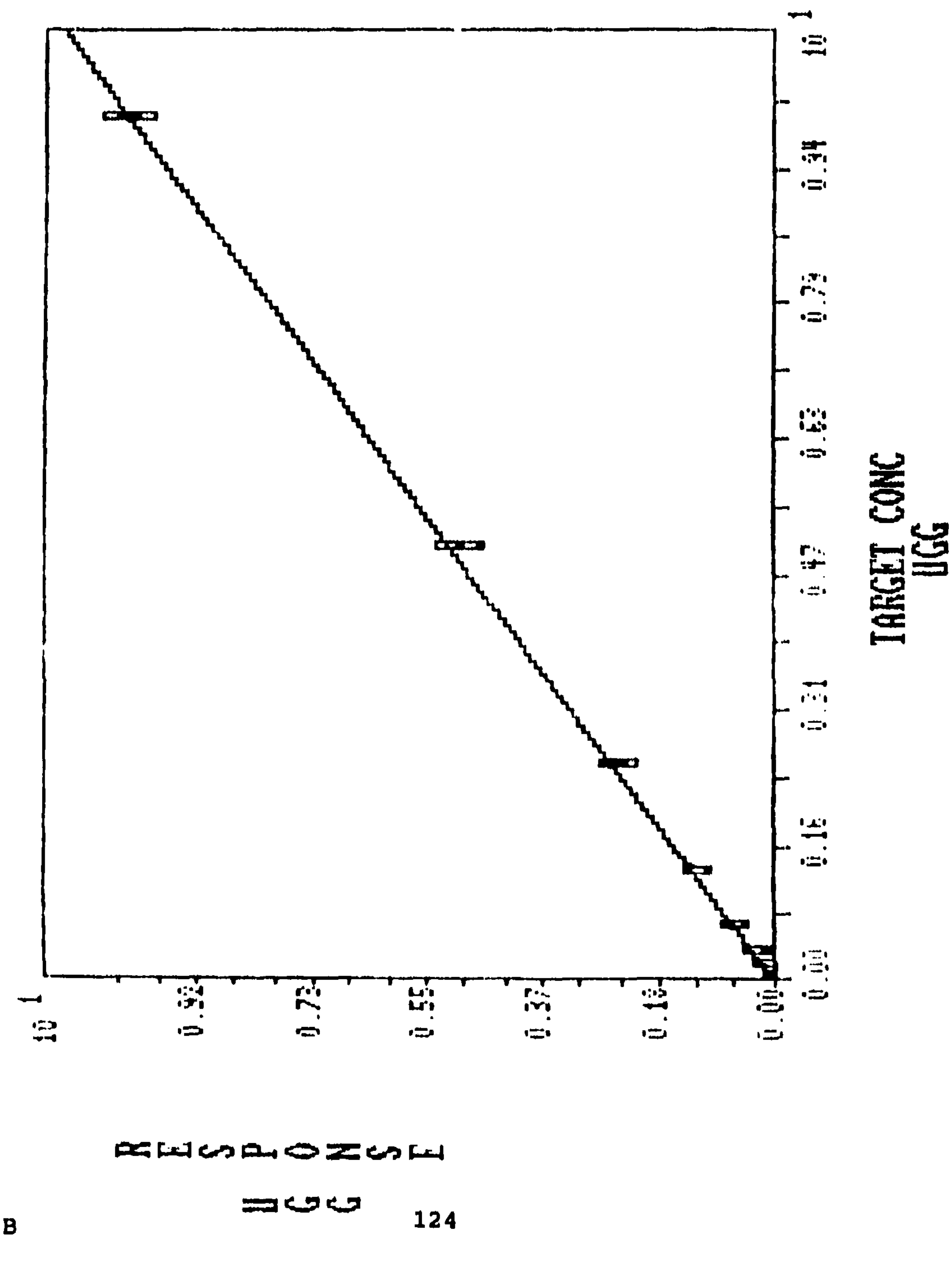


FIGURE F 21b

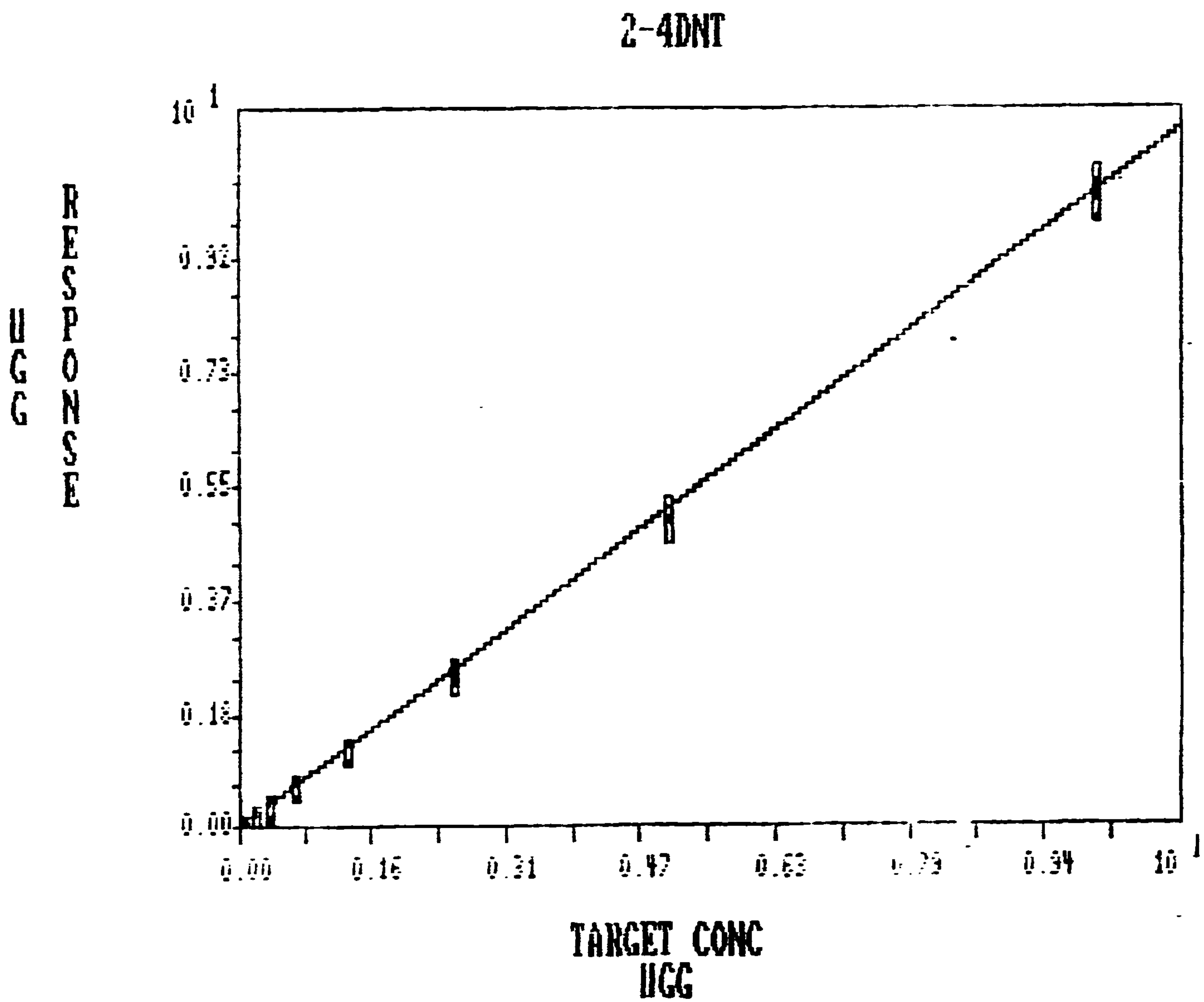

2-4DNT
RESPONSE
UGG
10 1
0.92
0.73
0.55
0.37
0.18
0.00
0.00
0.16
0.31
0.47
0.63
0.94
10 1
TARGET CONC
UGG

FIGURE F 22a

2,6

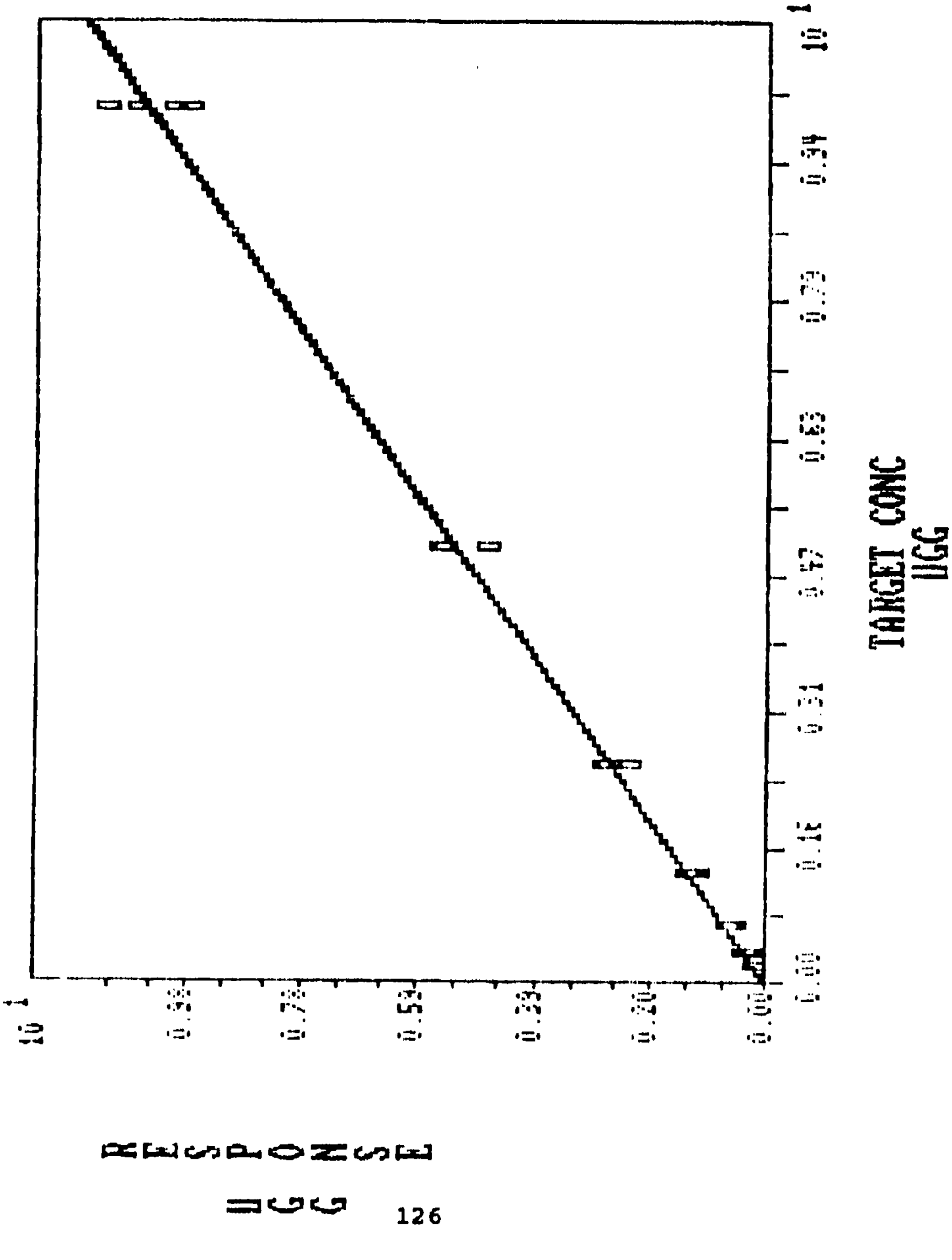


FIGURE F 22b

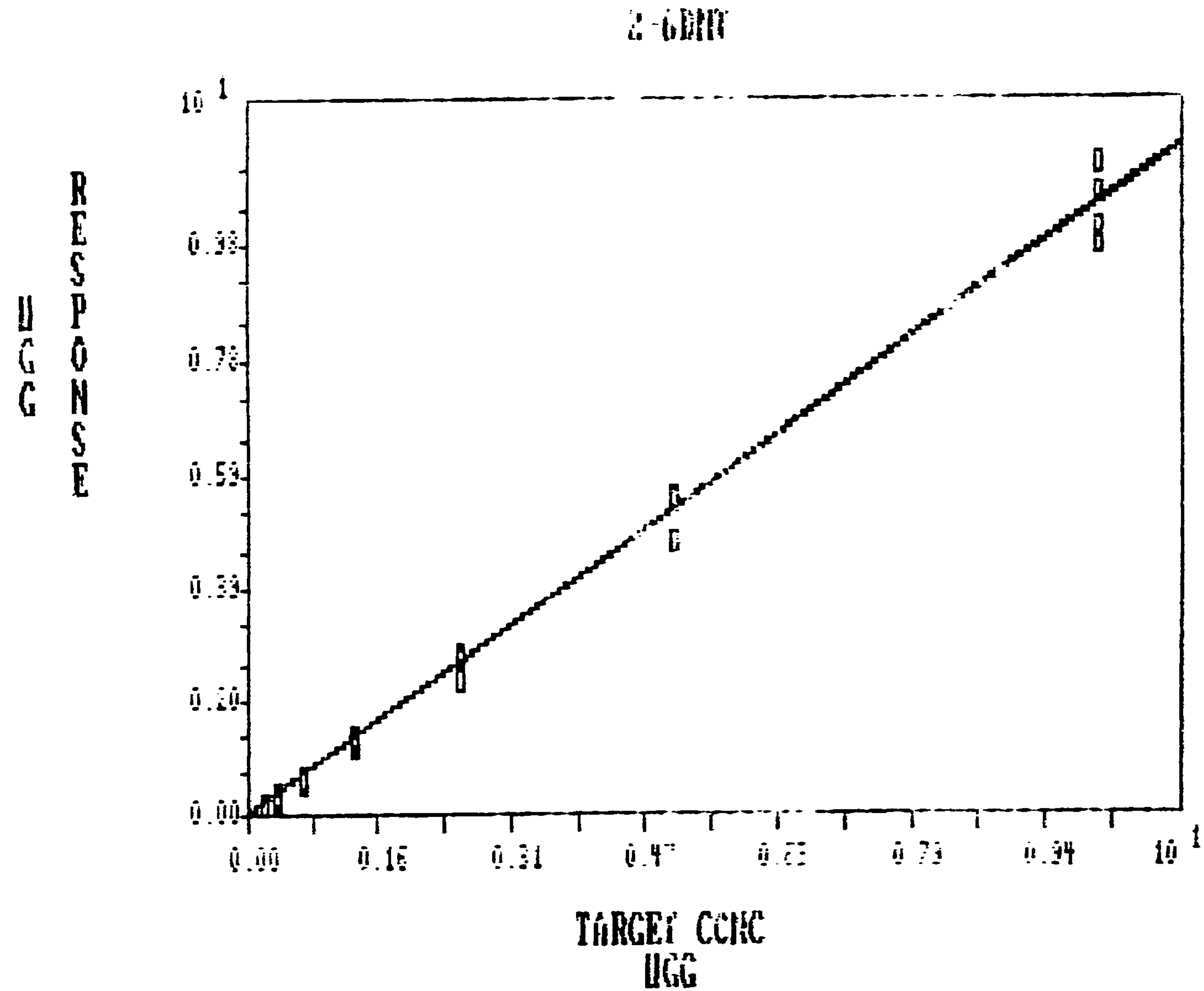


FIGURE F 23a

2AM

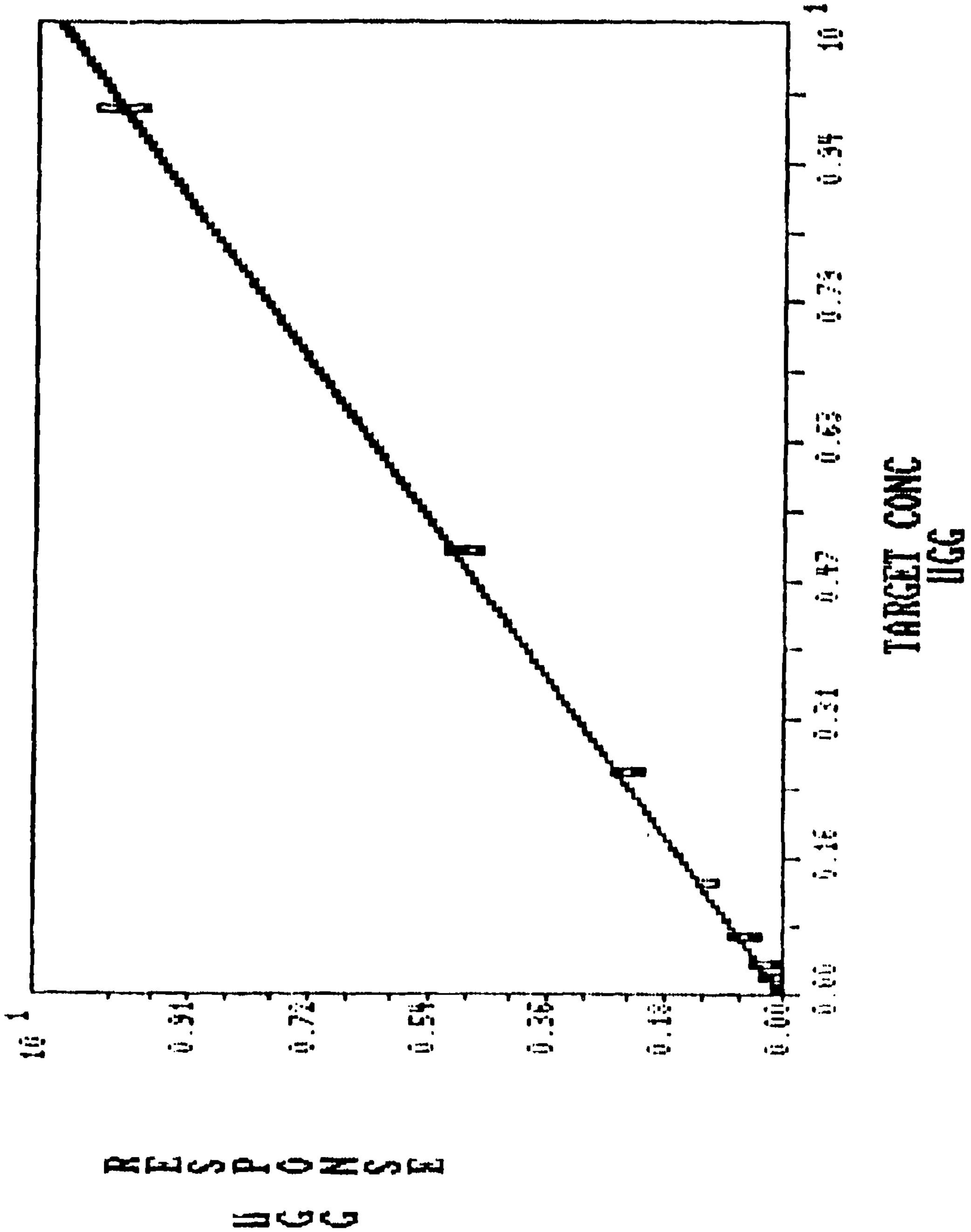


FIGURE F 23b

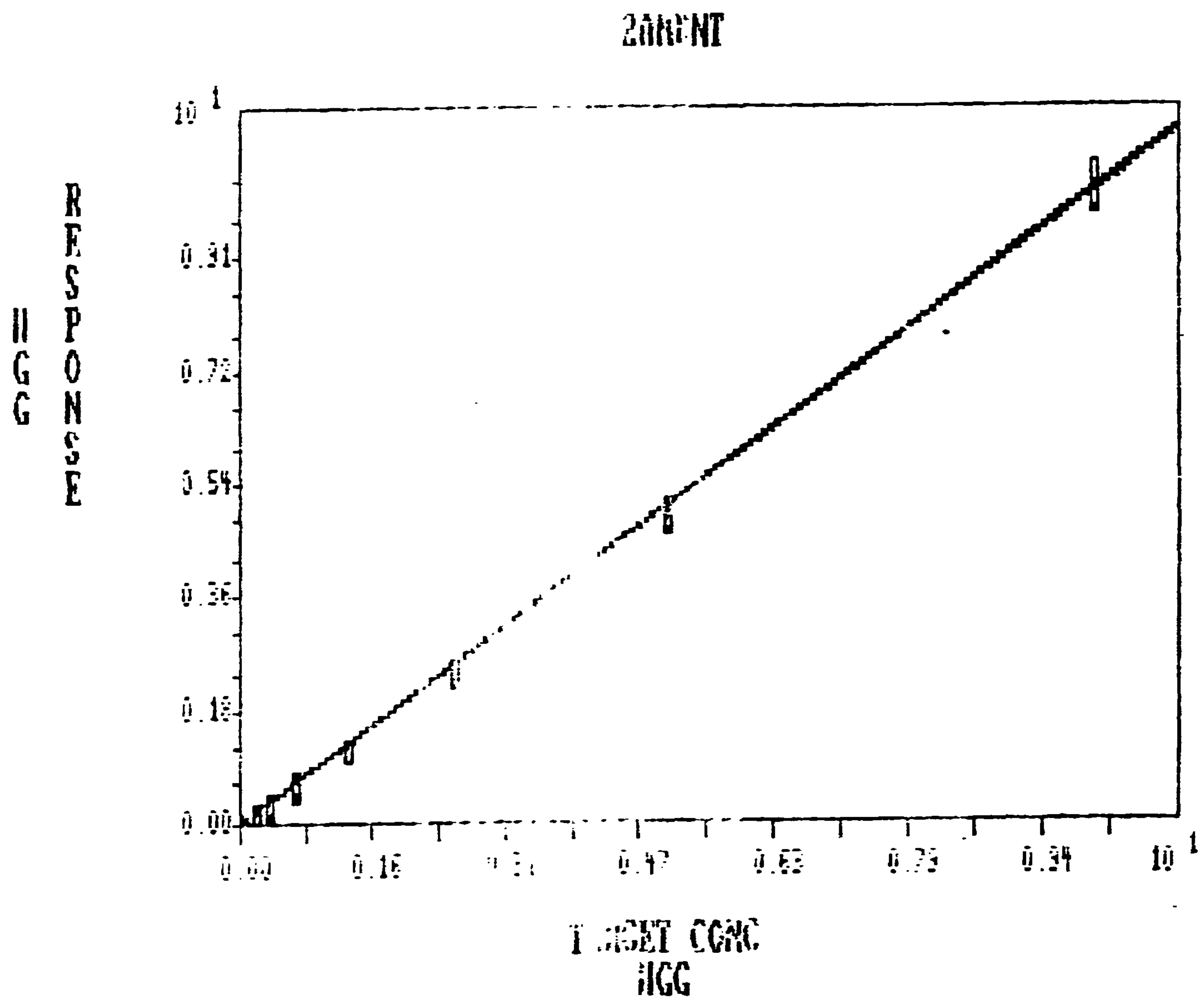


FIGURE F 24a

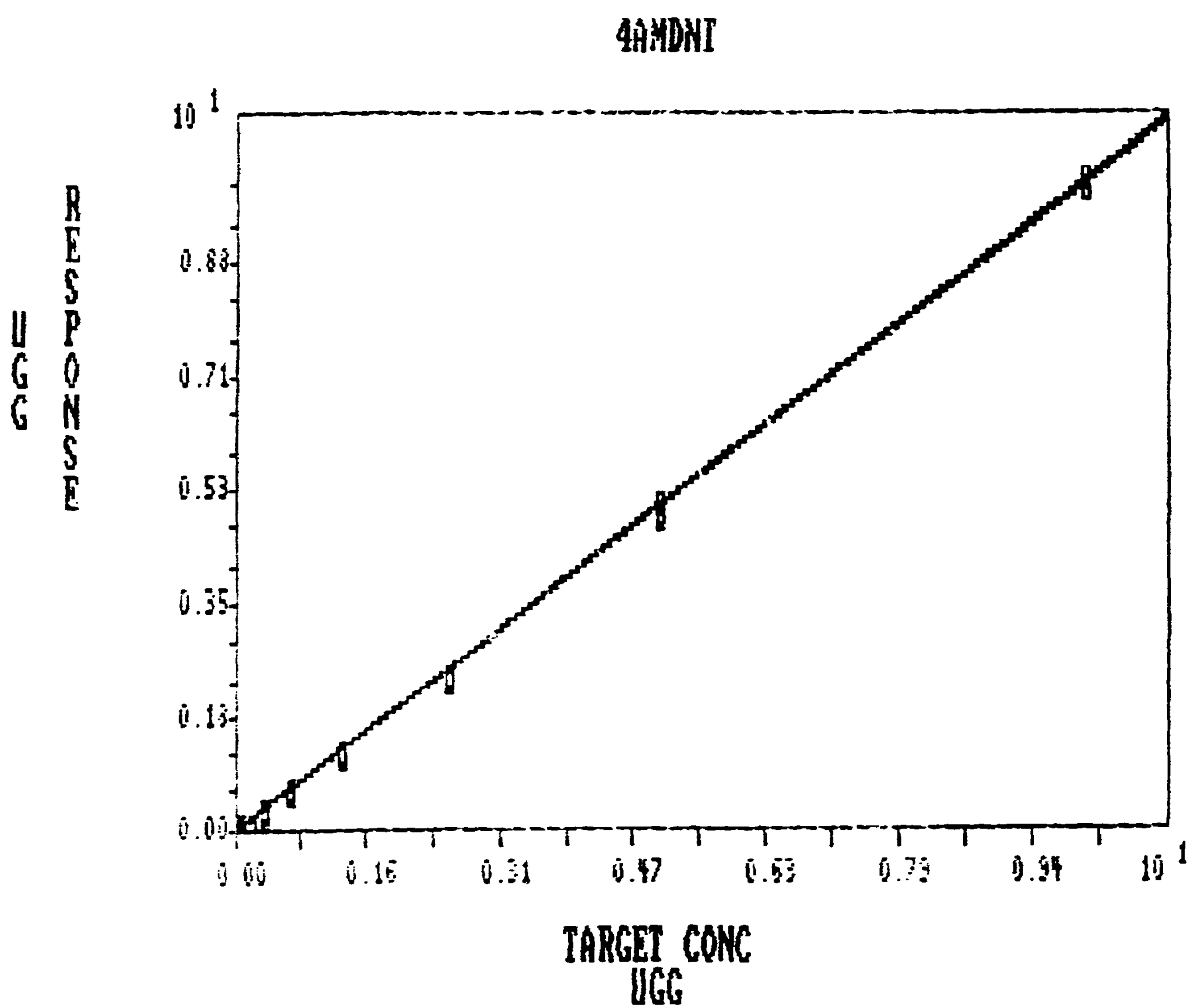

4AMDNT
10 1
0.88
0.71
0.53
0.35
0.18
0.00
RESPONSE
UGG
0.00
0.16
0.31
0.47
0.63
0.79
0.94
10 1
TARGET CONC
UGG

FIGURE F 24b

4AMDNT

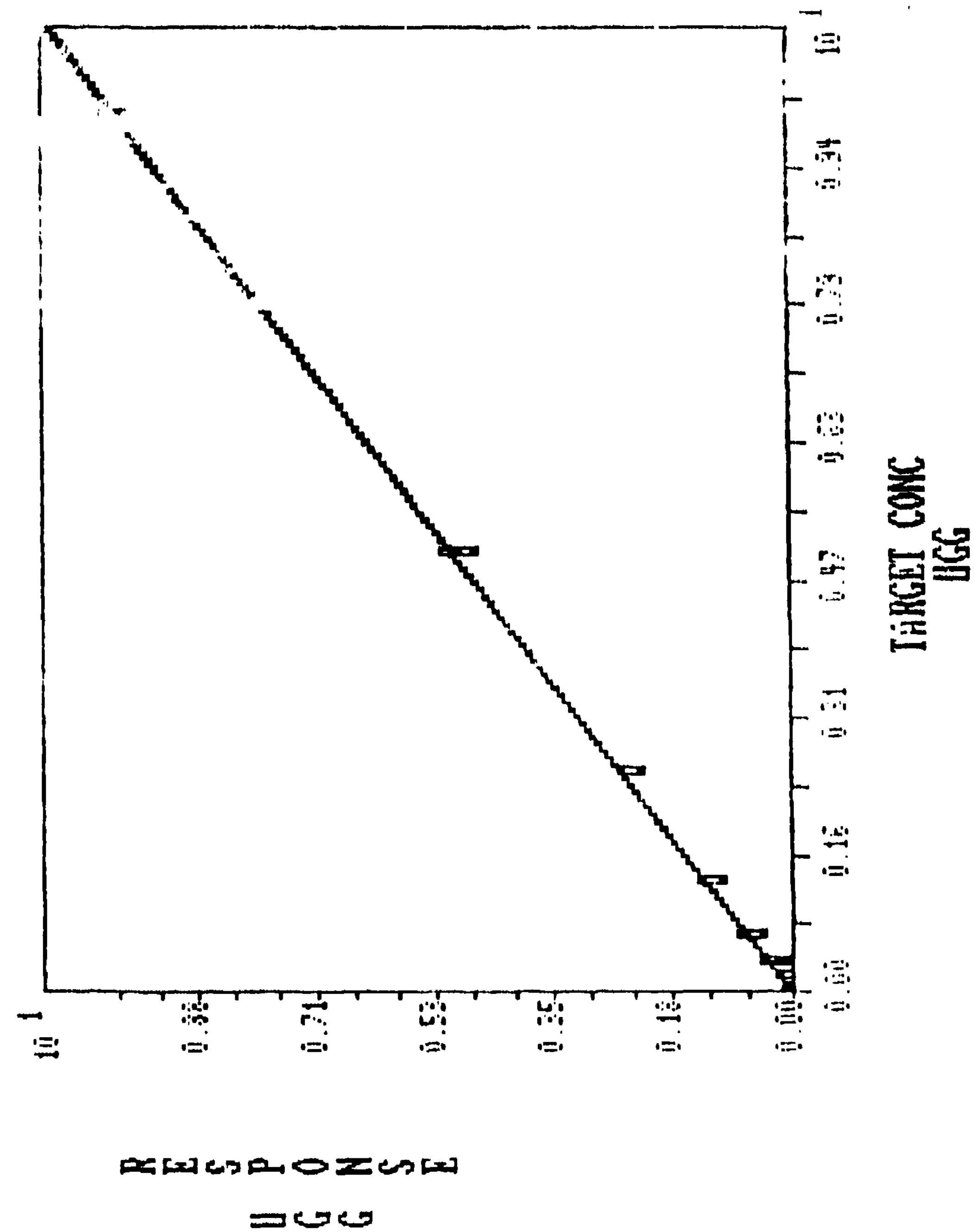
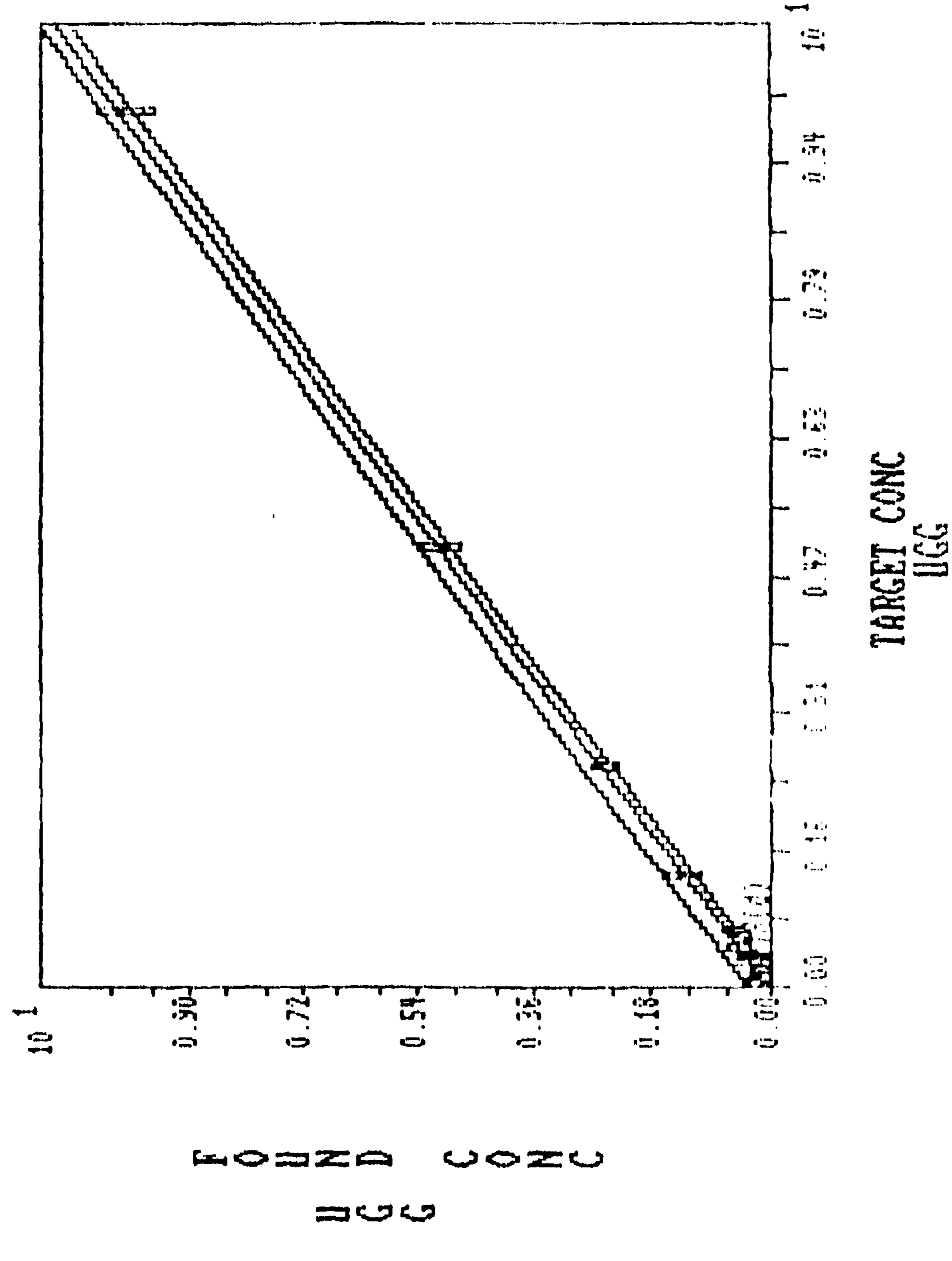


Figure F 25a

HMX



Appendix B

FIGURE F 25b

HMX

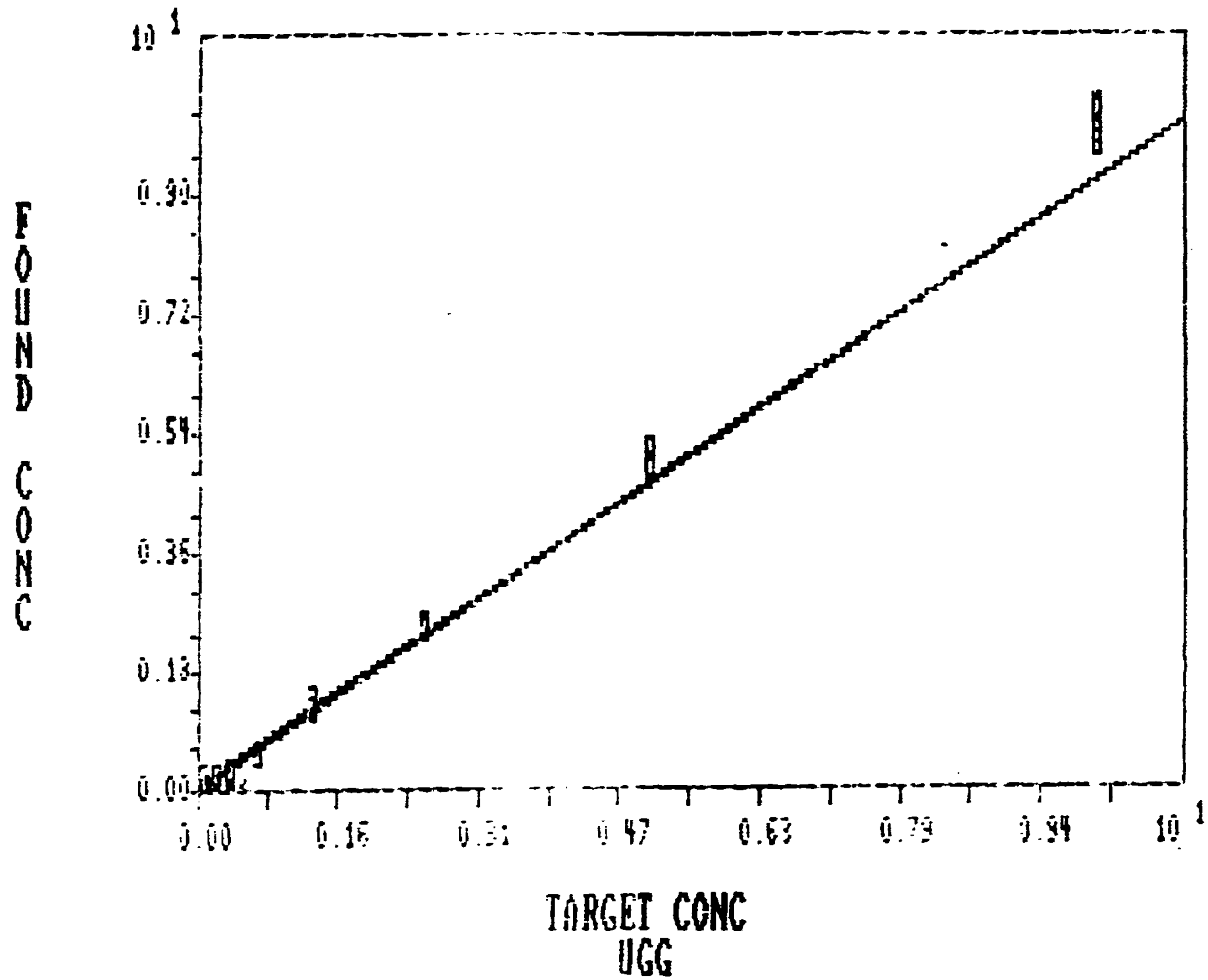


FIGURE F 26a

TNB

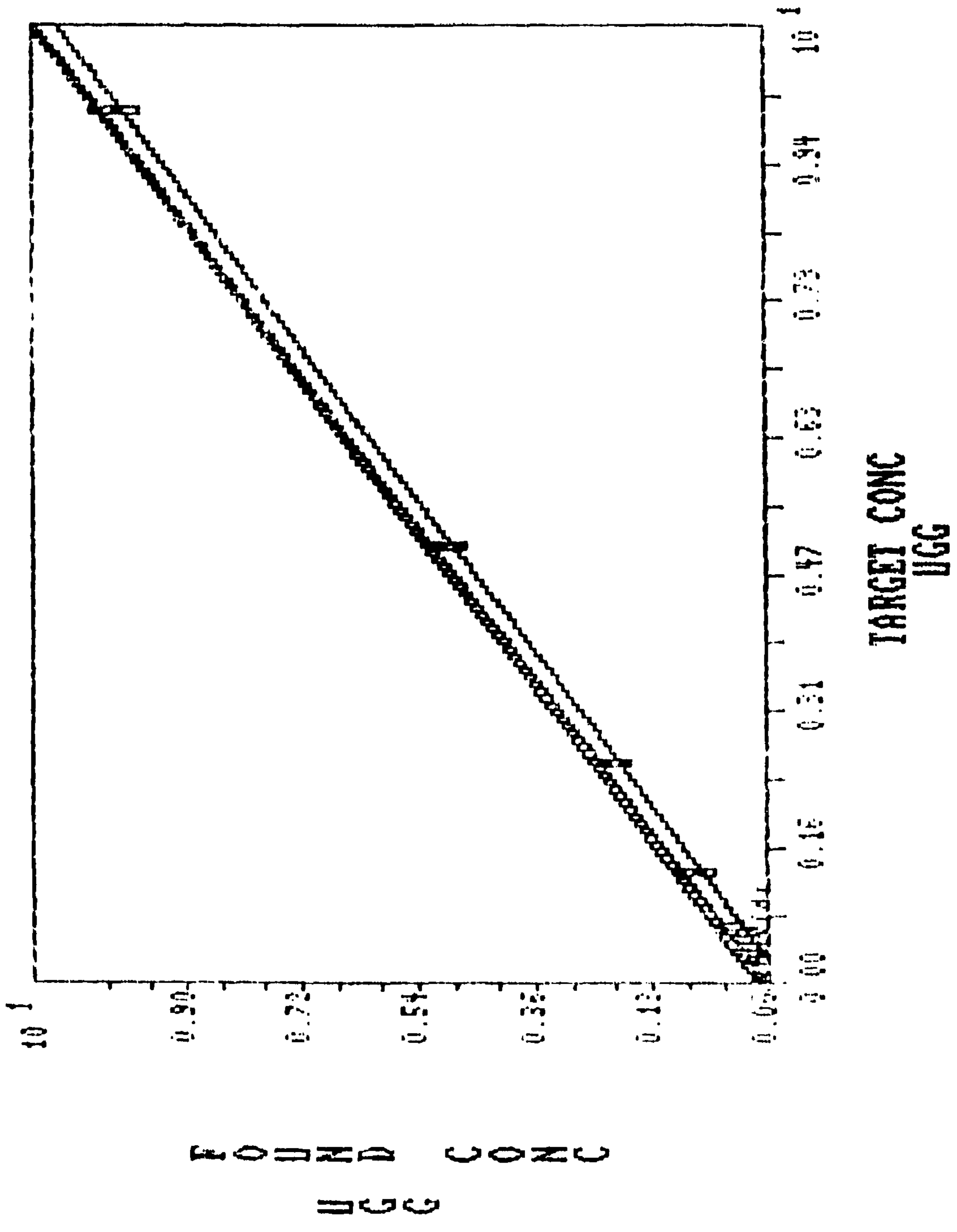


FIGURE F 26b

TNB

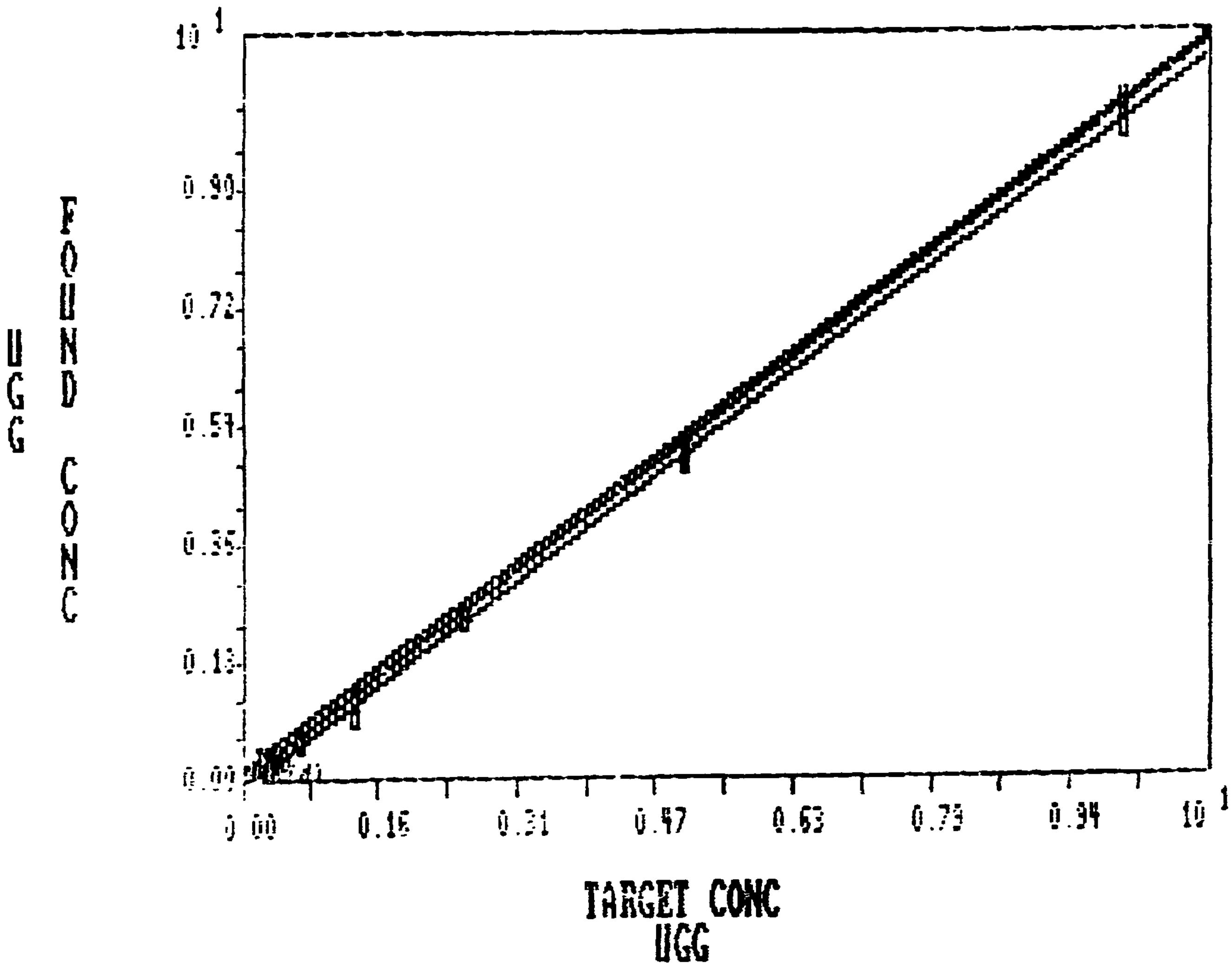


FIGURE F 27a

RDX

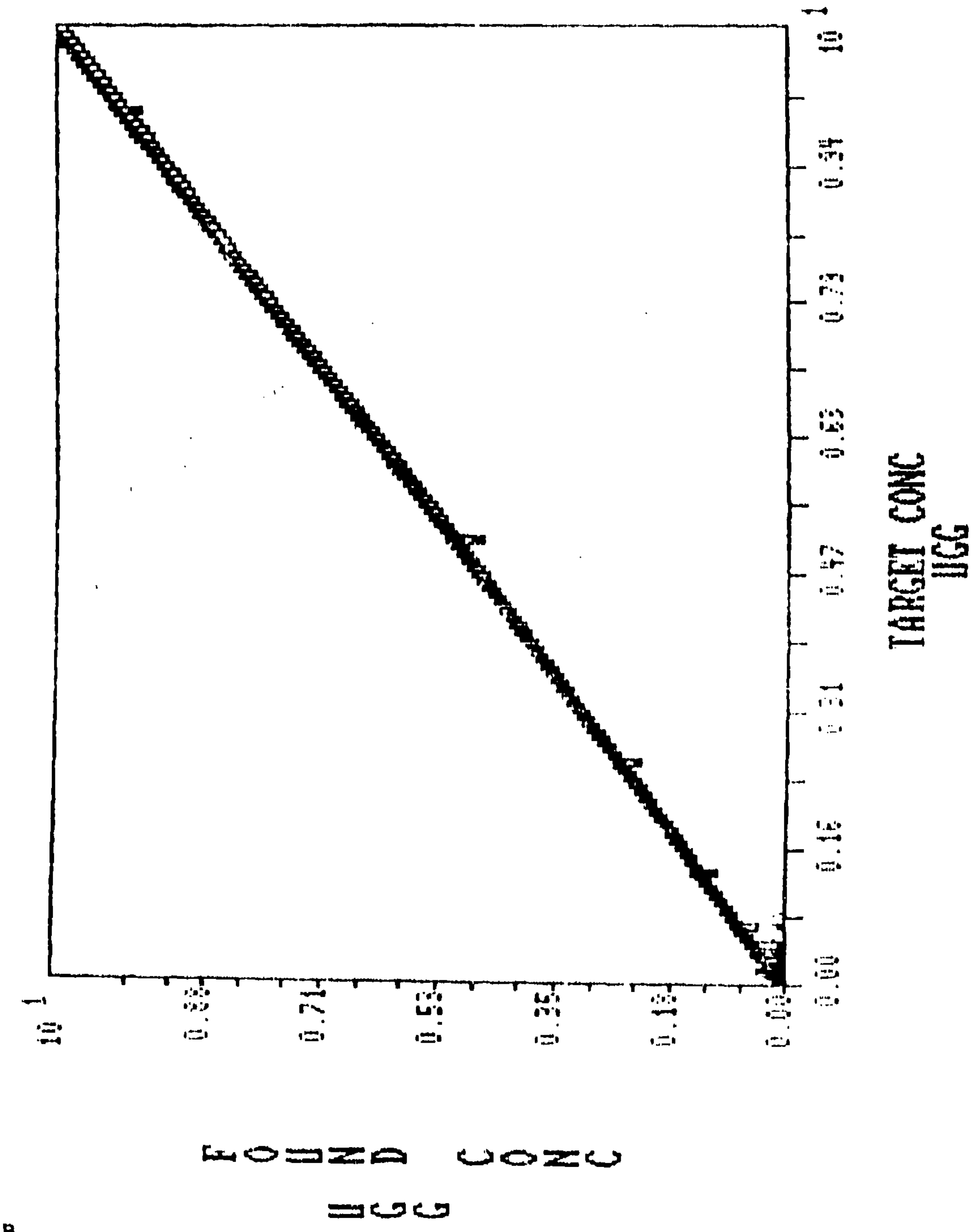


FIGURE F 27b

RDX

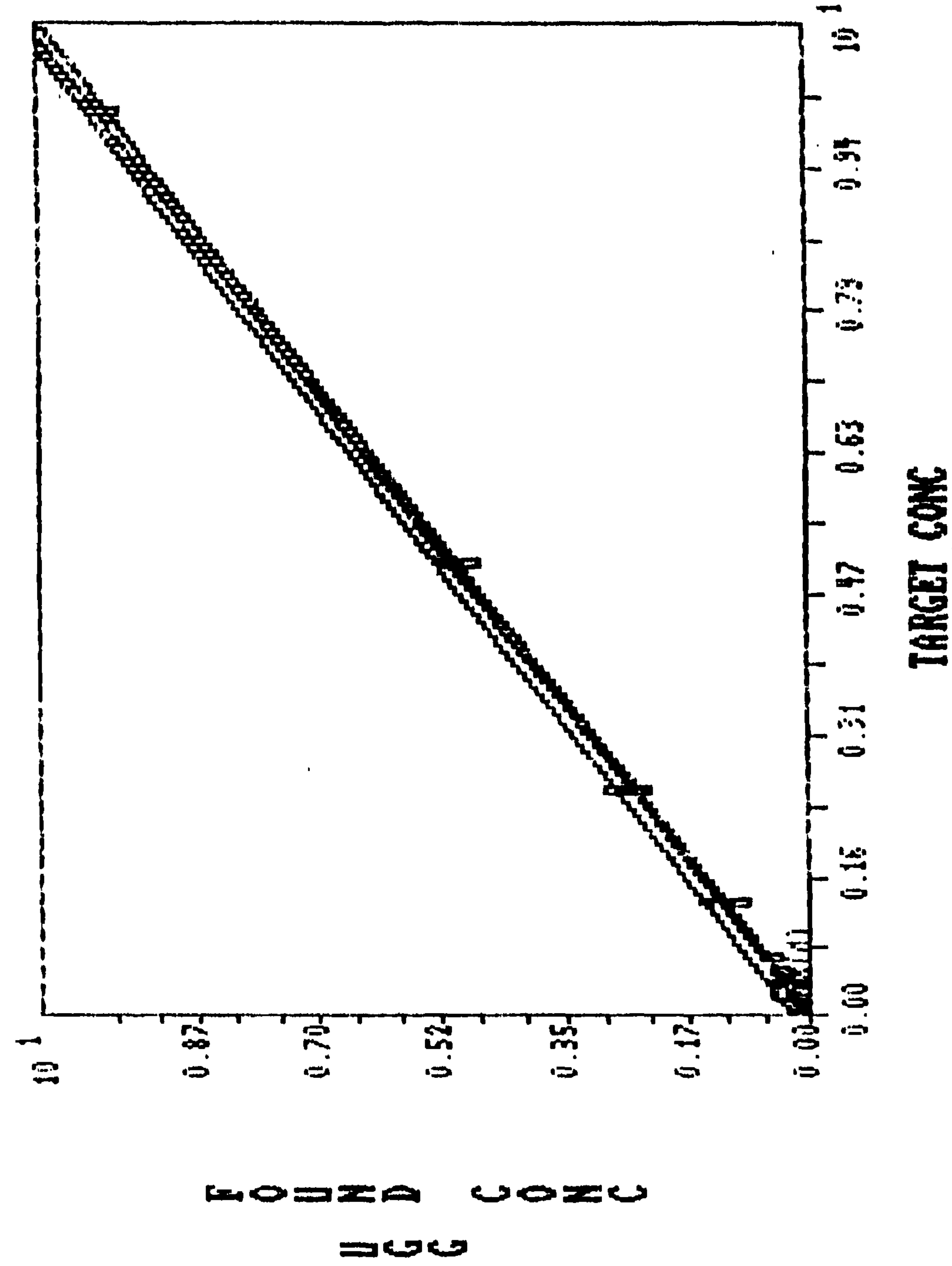


FIGURE F 28a

TNT

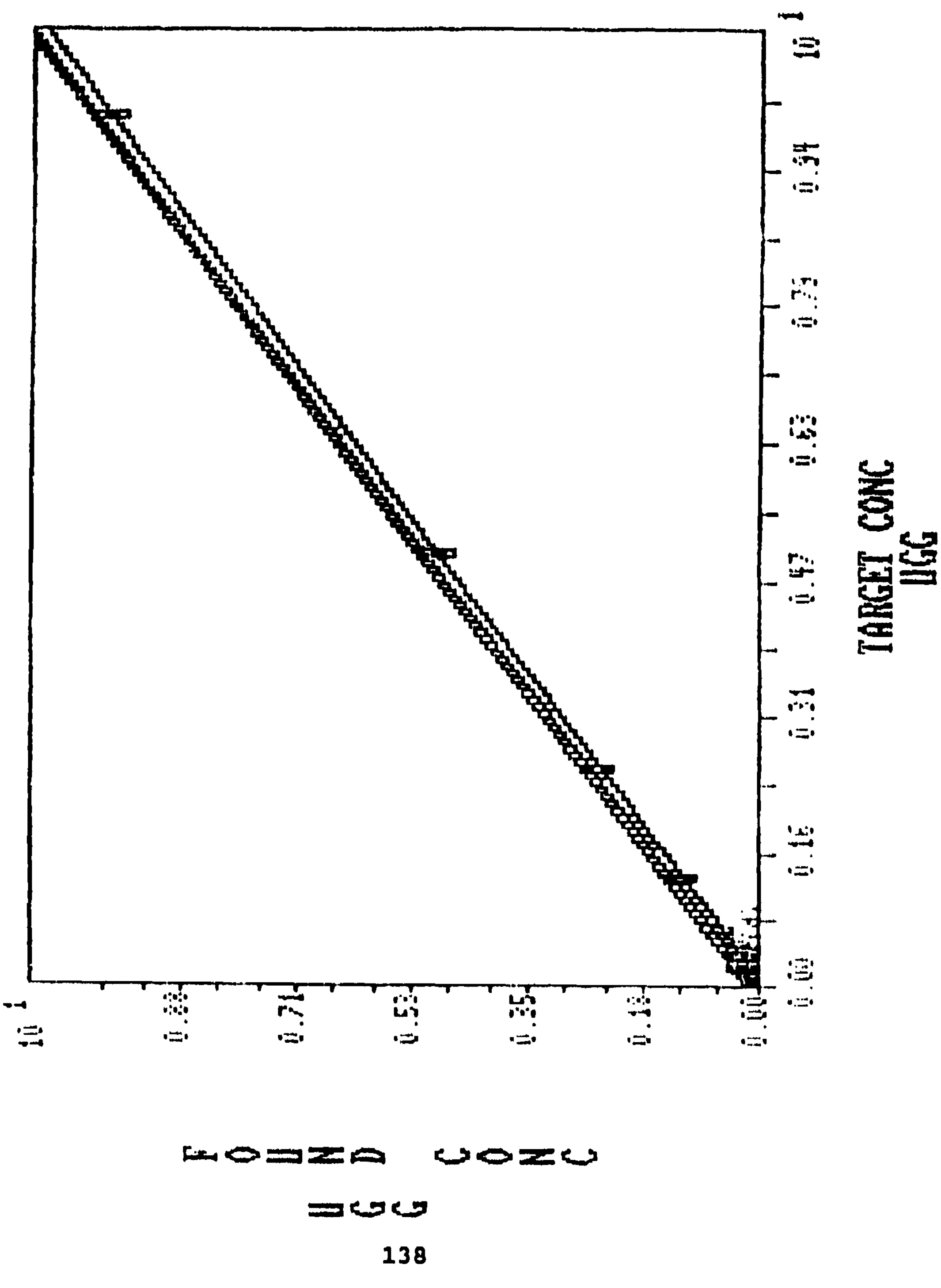


FIGURE F 28b

TNT

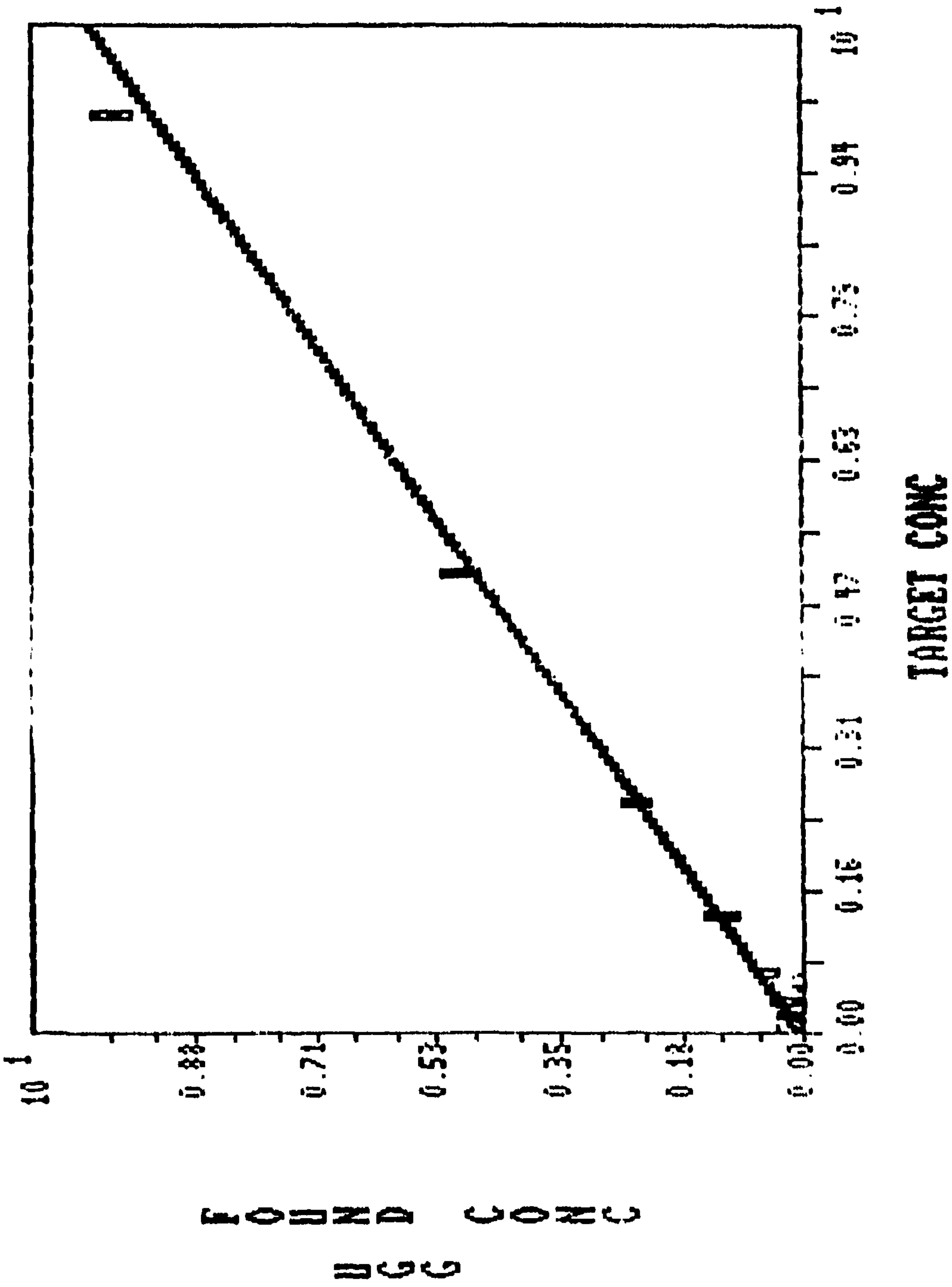
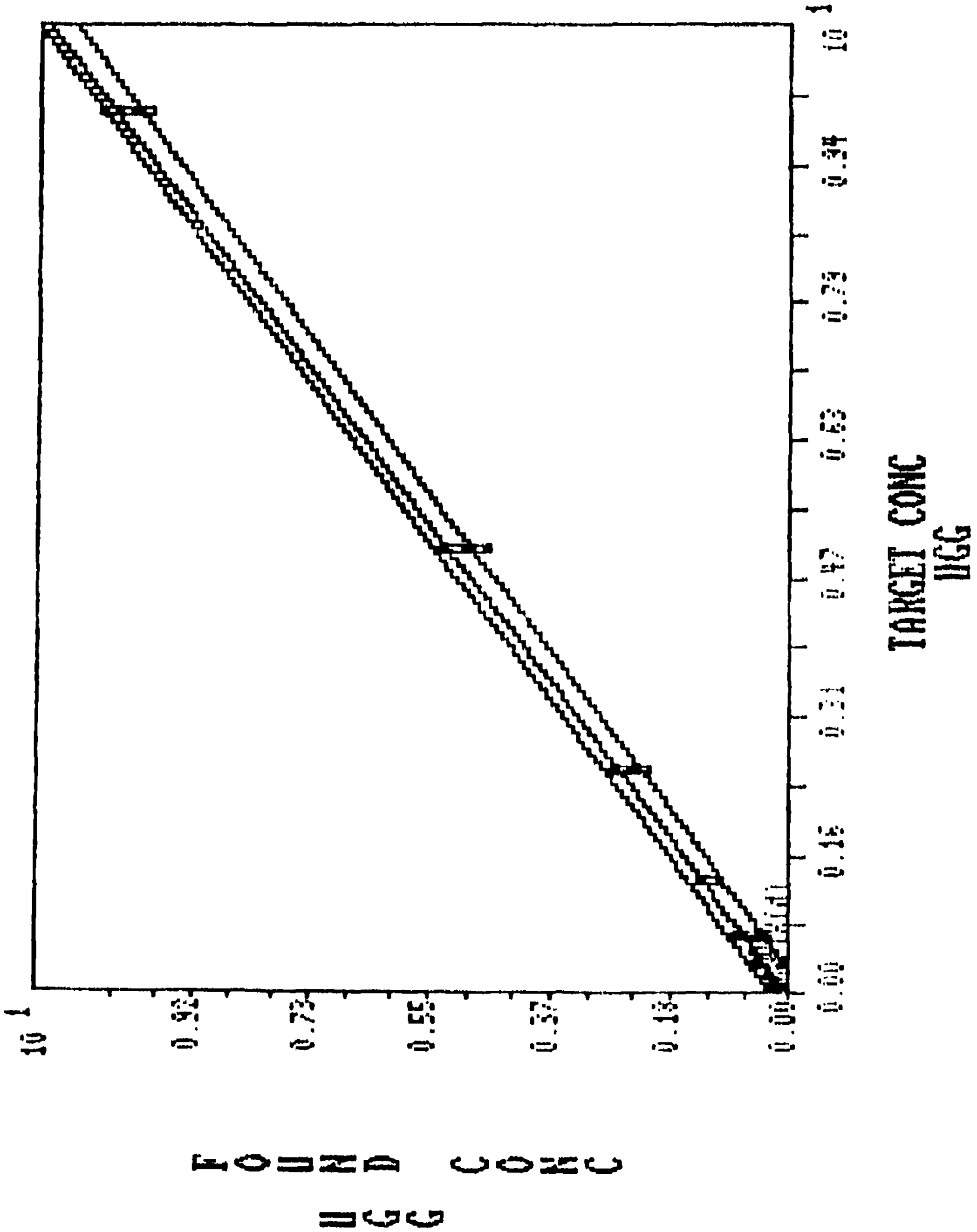


FIGURE F 29a

2,4



Appendix B

FIGURE F 29b

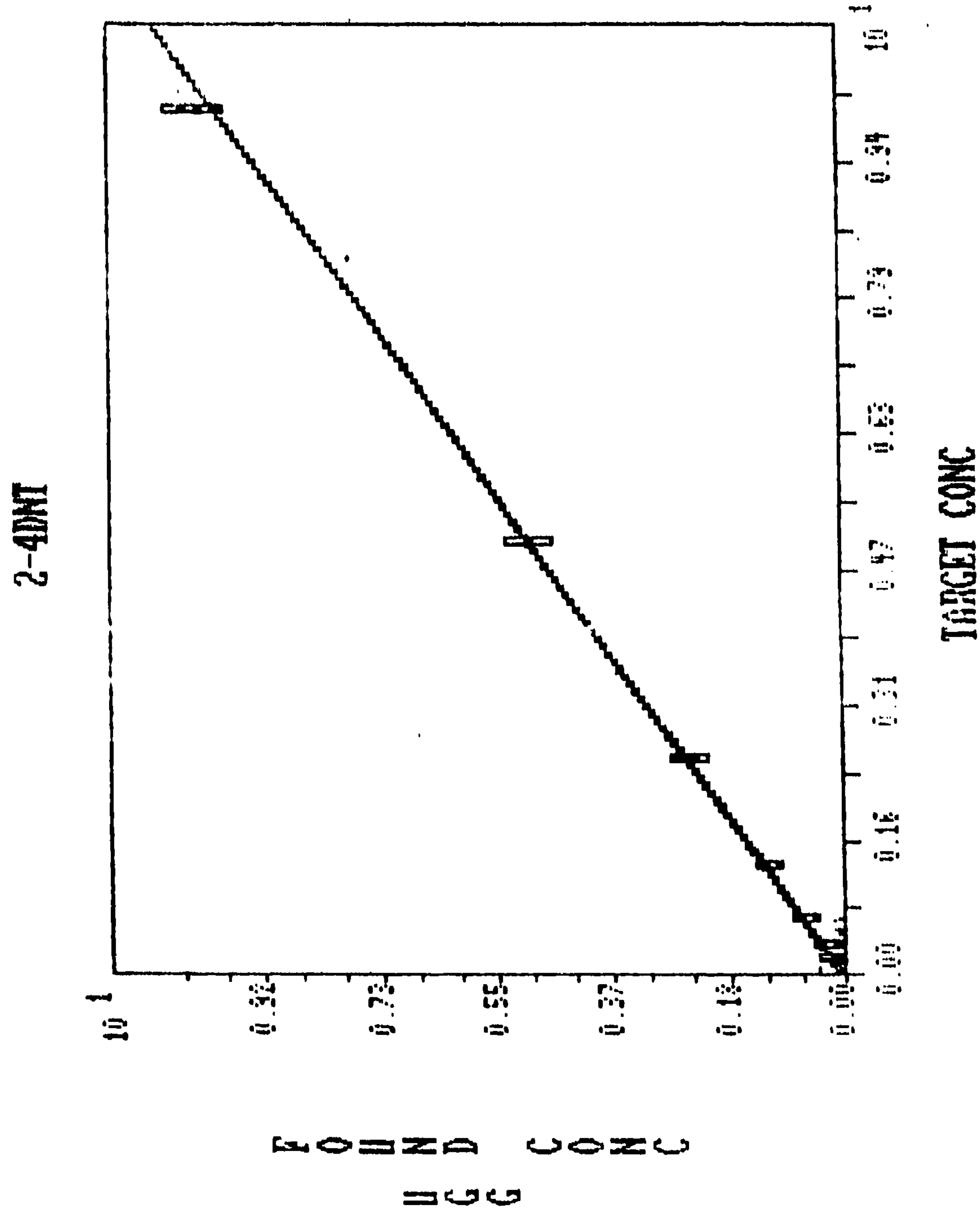


FIGURE F 30a

2,6

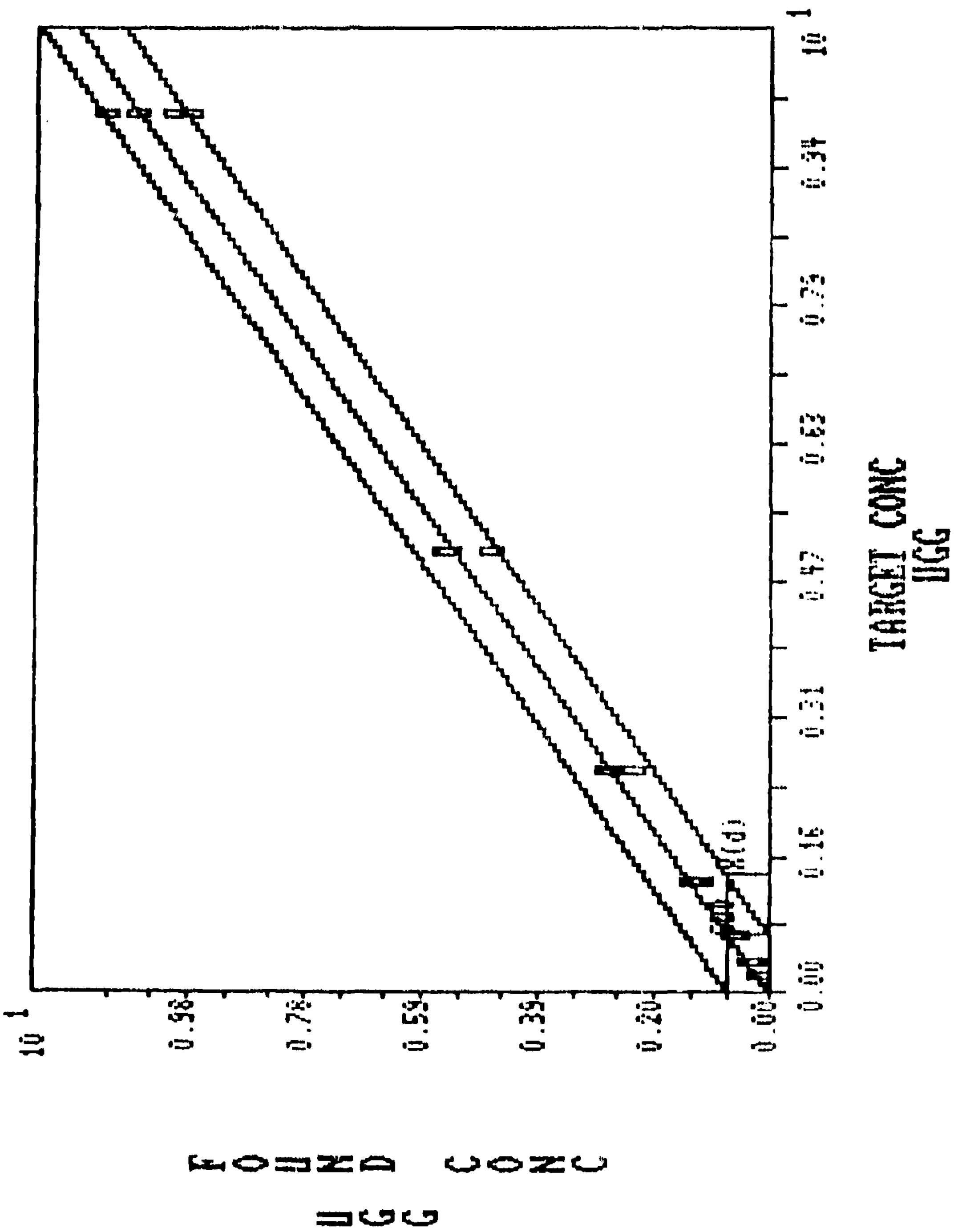


FIGURE F 30b

2-6DNT

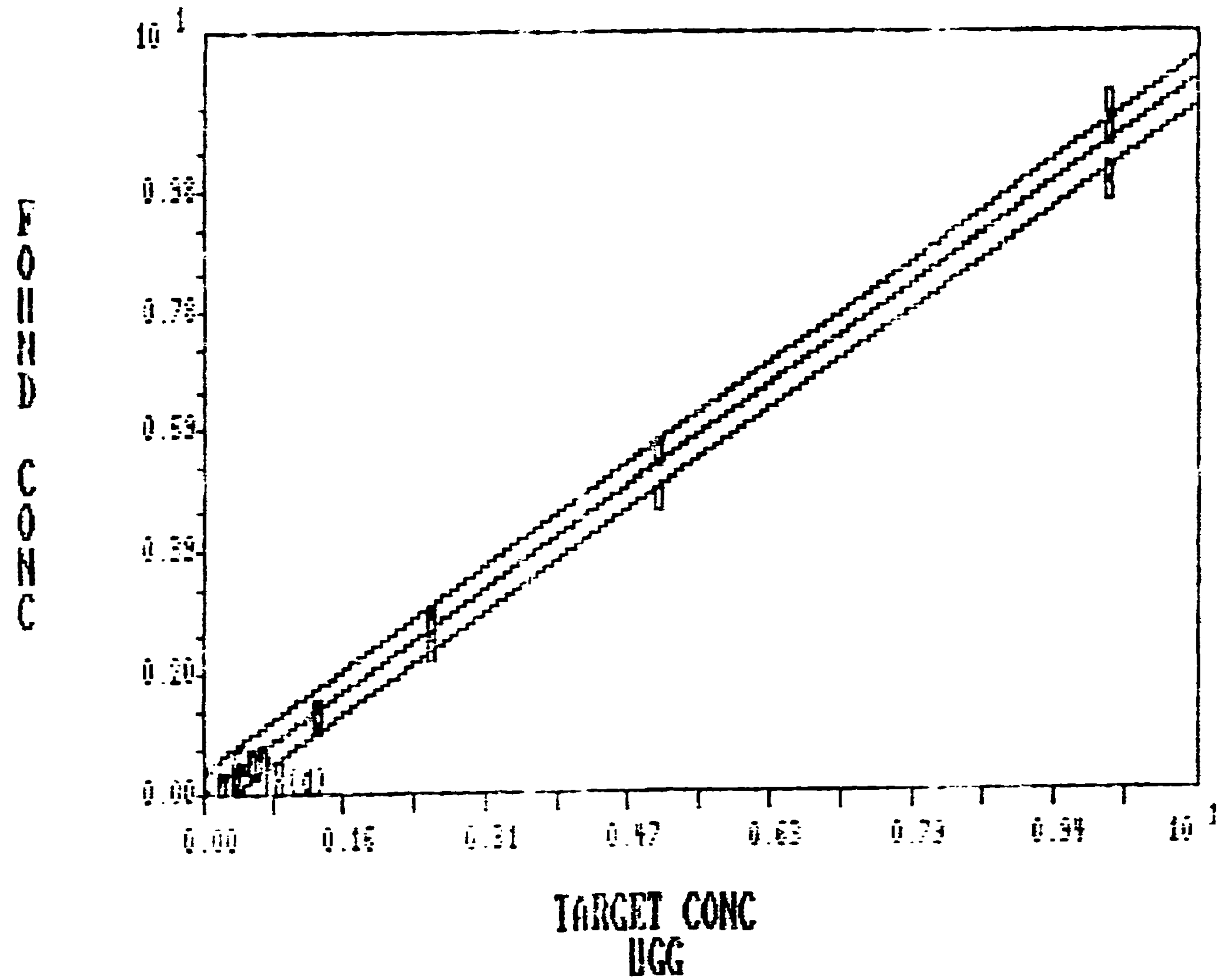


FIGURE F 31a

2AM

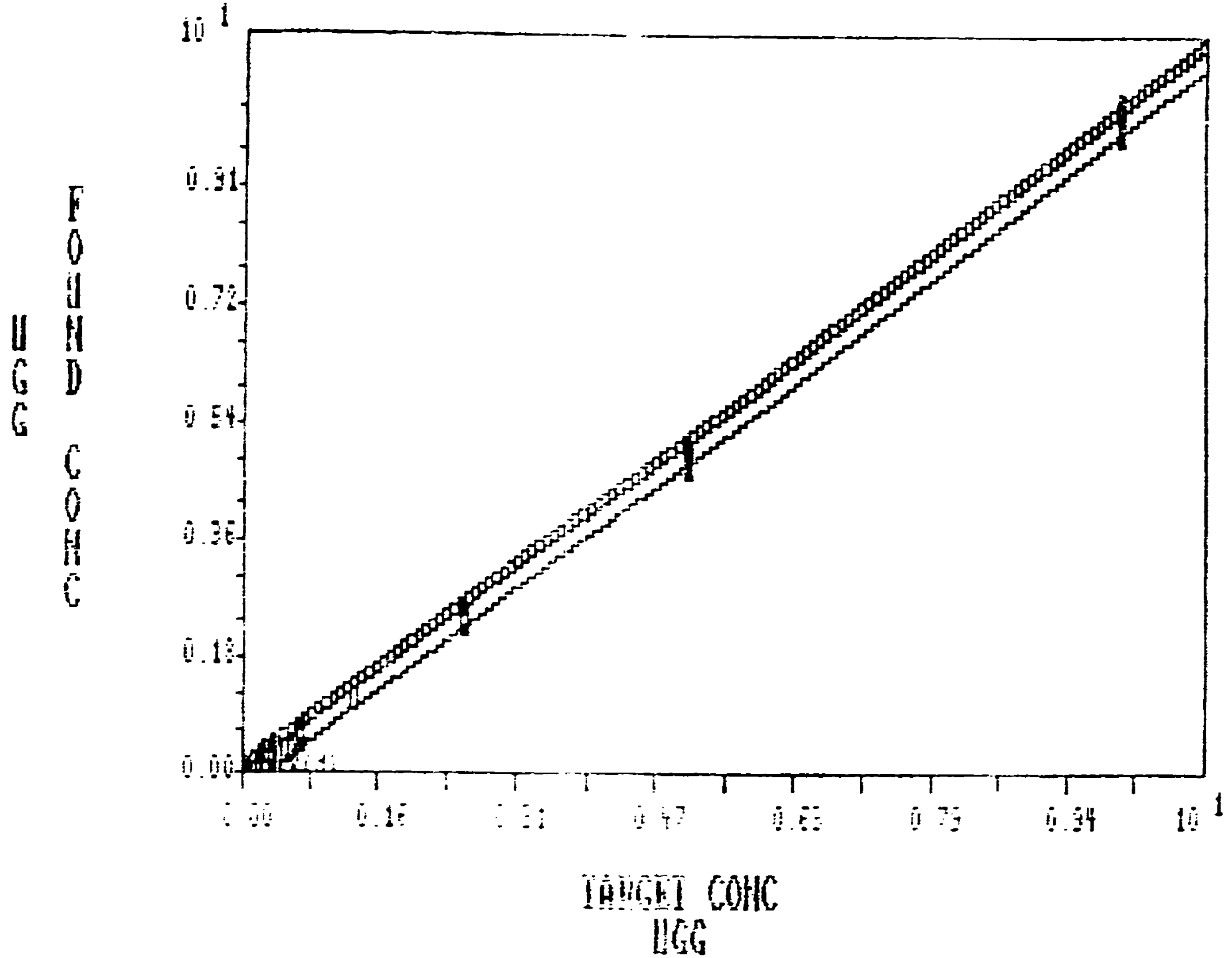


FIGURE F 31b

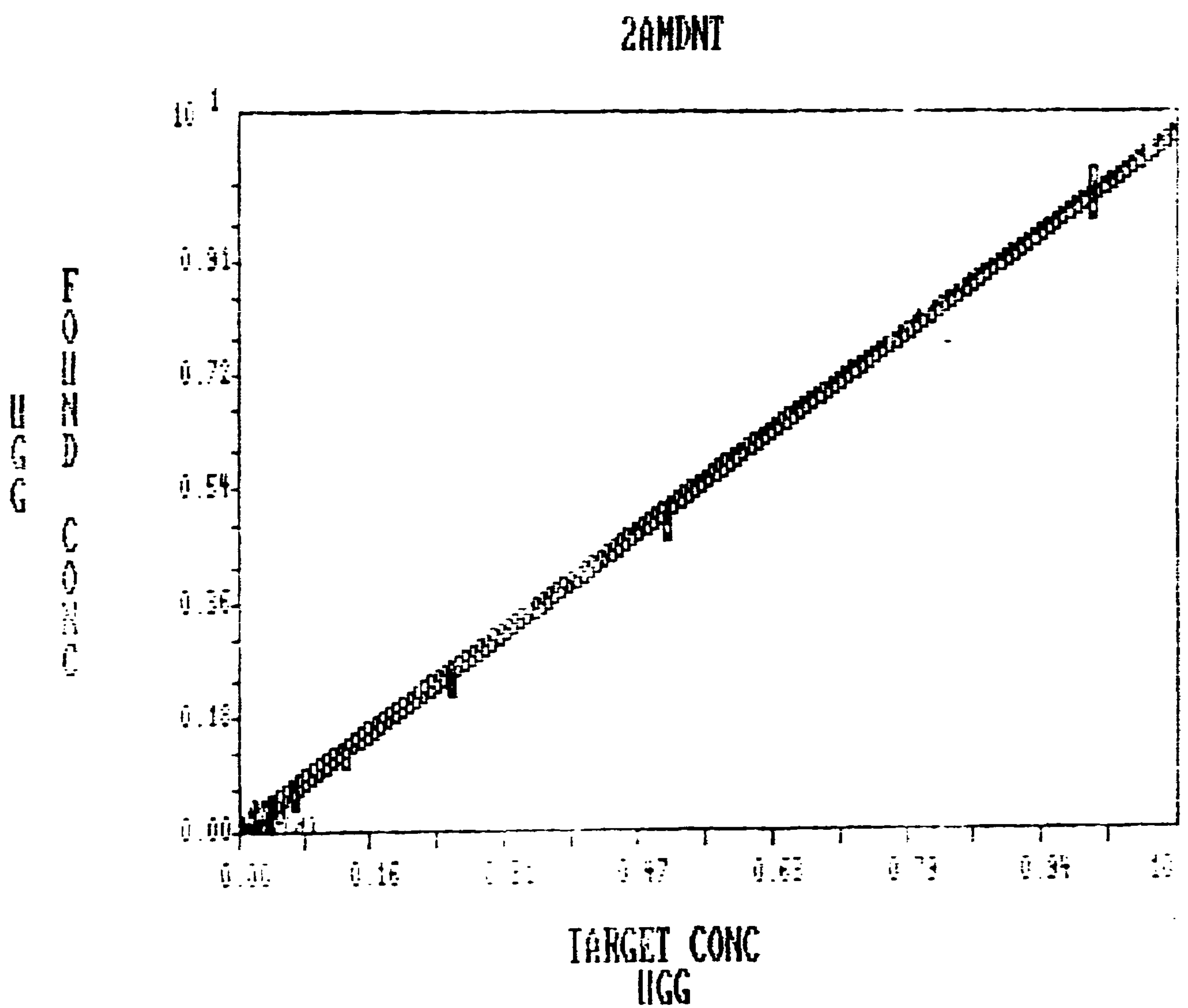


FIGURE F 32a

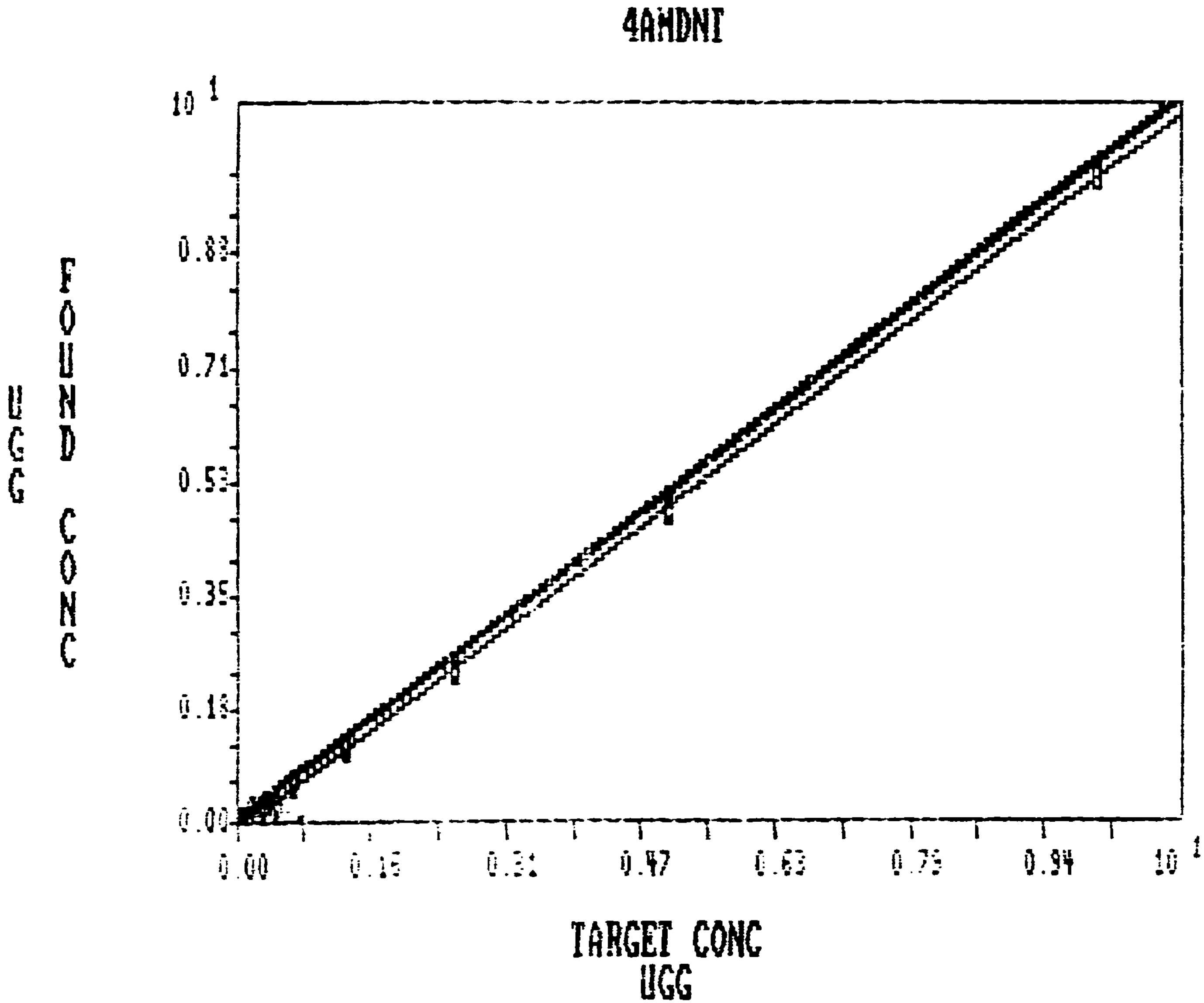

4AHDNI
FOUND CONC
UGG
TARGET CONC
UGG
0.00
0.15
0.31
0.47
0.63
0.79
0.94
0.83
0.71
0.53
0.35
0.18
10 1

FIGURE F 32b

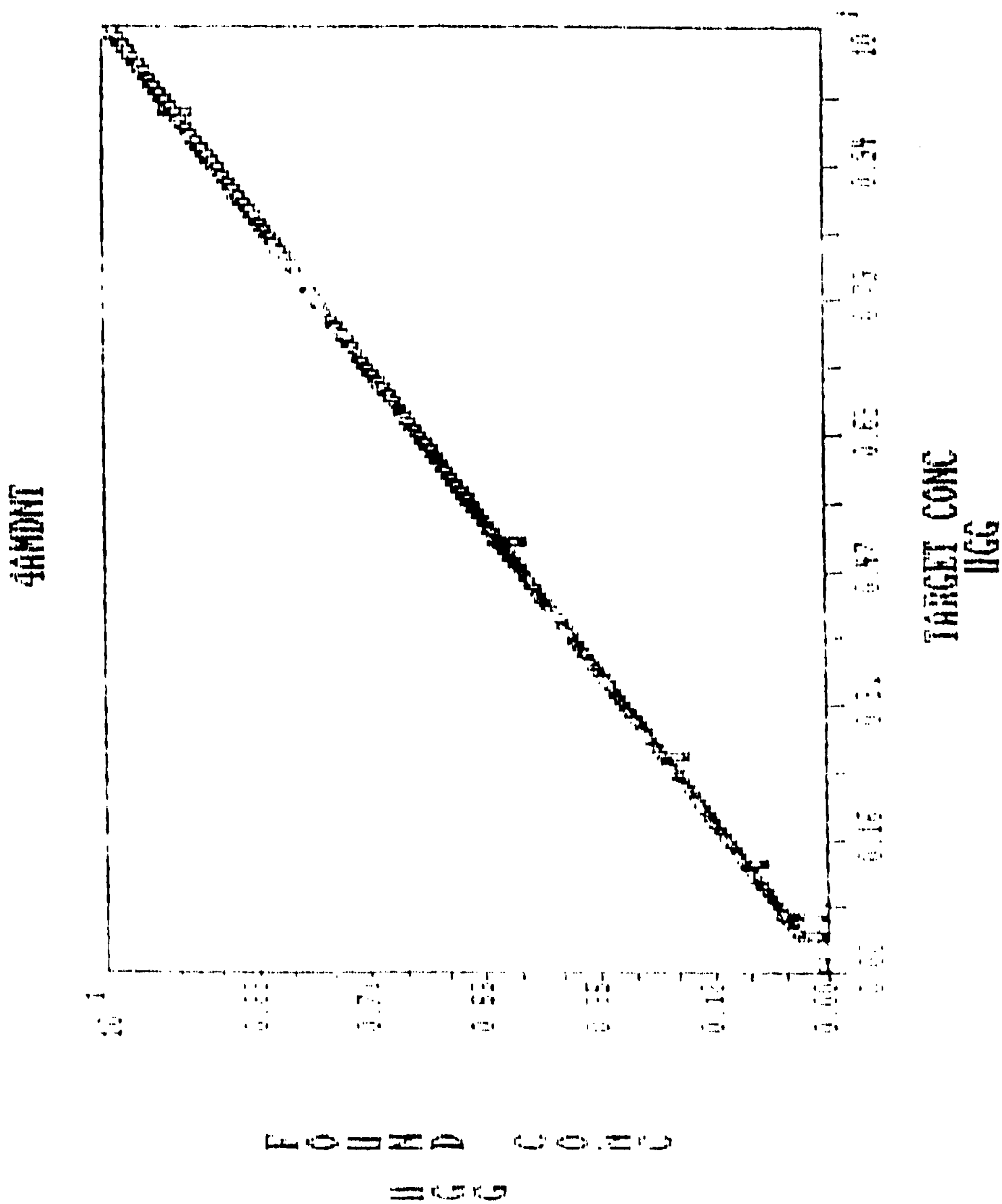


TABLE F18
CRITERION OF DETECTION WATER AND SOLVENT (mg/L)

COMPOUND	CD-R	CD-M
HMX	0.14	0.14
TNB	0.13	0.15
RDX	0.17	0.07
DNB	0.15	0.15
TNT	0.09	0.09
2,4 DNT	0.18	0.17
2,6 DNT	0.35	0.37
2-AM	0.14	0.14
4-AM	0.10	0.12

CD-R=Detection for Radford; CD-M Detection for Milan

APPENDIX C

METAL ANALYSES FOR MAAP

Concentrations of selected metals were determined for soil from MAAP site. Samples from uncontaminated soil, contaminated soil/ash, and contaminated/fortified soil/ash were extracted to determine total extractable Cd, Cr, Cu, Pb, and Zn levels. Duplicate 4-g air-dried samples were heated with 20 mL of 1.0 M HNO_3 for 3 h, filtered by gravity, and diluted to a 50-mL volume with ultrapure water (reverse osmosis followed by double deionization). All extracts were analyzed for metals by atomic absorption spectrophotometry (Perkin Elmer Model 3030 AA Spectrometer). Corresponding standard solutions, and blank, duplicate and split samples were also analyzed to assure quality control. Mean values of metal levels are presented in table C-1.

Table C-1. Concentrations of selected metals from Milan Army Ammunition Plant (MAAP) soil and soil/ash.

	Cd	Cr	Cu	Pb	Zn
			mg kg^{-1}		
Uncontaminated Soil					
	0.56 ± 0.03	6.2 ± 0.2	9.4 ± 0.1	9.6 ± 0.02	48 ± 3
Contaminated Soil/Ash					
	9.0 ± 0	47 ± 1.7	928 ± 52	534 ± 15	2496 ± 2
Contaminated Fortified Soil/Ash					
	9.0 ± 0.01	34 ± 5.4	931 ± 92	621 ± 7	2336 ± 3

Blank

APPENDIX D

MILAN ARMY AMMUNITION PLANT

MUNITION RESIDUE DATA FROM SOIL AND LEACHATE SAMPLES

The amount of munition residue in each leachate was calculated by multiplication of the sample volume by the concentration. The amount of residue in each soil section was calculated by multiplication of the concentration of munition residue in the soil by the soil weight.

When a value of less than the criteria of detection (trace concentration) appears in tables of concentration, an "*" was entered in the corresponding amount table (concentration x leachate volume or concentration x soil weight). Zero values in the amount tables corresponded to a "none detected" (0) level in the concentration tables.

TABLE D-1. Leachate volumes (mL) from Milan Army Ammunition Plant (MAAP) soil columns.

DAY #	3	7	10	14	17	21	24	28
POS. #	JUL 26	JUL 30	AUG 2	AUG 6	AUG 9	AUG 13	AUG 16	AUG 20
					mL			
6	65	76	72	118	116	135	112	187
10	135	68	122	85	62	73	145	99
5	152	96	136	132	137	134	134	275
8	117	74	148	104	129	117	118	106
3	134	67	140	96	132	106	126	116
7	154	88	164	68	152	135	84	128
1	150	84	172	120	154	139	138	133
11	121	74	116	98	126	118	118	270
2	144	96	157	125	143	134	145	129
4	153	88	150	120	139	124	135	128
12	105	72	150	83	124	110	110	258
AVG.	130.00	80.27	138.82	104.45	128.55	120.45	124.09	166.27
STD. DEV.	25.81	10.09	26.42	19.37	23.77	18.43	17.36	65.74
% REL. STD. DEV	19.85	12.57	19.03	18.55	18.49	15.30	13.99	39.54

DAY #	31	35	38	43	45	49	52	56
POS. #	AUG 23	AUG 27	AUG 30	SEP 4	SEP 6	SEP 10	SEP 13	SEP 17
					mL			
6	170	110	118	102	78	-	-	-
10	110	92	106	80	72	-	-	-
5	156	132	140	36	117	150	124	124
8	144	110	128	102	84	126	90	92
3	126	104	130	100	68	132	114	108
7	160	124	154	138	109	166	136	124
1	150	138	152	136	107	172	118	124
11	134	110	112	112	74	138	106	94
2	158	122	148	126	108	150	116	120
4	146	118	136	118	93	160	126	118
12	132	122	126	108	82	118	93	88
AVG.	144.18	116.55	131.82	105.27	90.18	145.78	113.67	110.22
STD. DEV.	16.61	12.45	15.22	27.21	16.57	17.47	14.25	14.22
% REL. STD. DEV	11.52	10.68	11.55	25.85	18.37	11.99	12.54	12.90

TABLE D-1. Continued...

DAY #	59	63	66	70	73	78	80	84
POS. #	SEP 20	SEP 24	SEP 27	OCT 1	OCT 4	OCT 9	OCT 11	OCT 15
	mL							
6	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-
5	132	155	70	110	118	126	102	144
8	100	90	46	56	80	54	72	107
3	130	144	80	108	116	110	93	138
7	134	143	92	110	122	132	95	145
1	140	146	104	122	130	136	102	154
11	102	88	58	68	102	92	75	116
2	140	150	70	112	122	122	100	138
4	141	134	100	109	126	128	96	145
12	122	112	69	86	122	112	90	120
AVG.	126.78	129.11	76.56	97.89	115.33	112.44	91.67	134.11
STD. DEV.	14.89	24.37	18.18	21.31	14.51	24.25	10.45	14.99
% REL. STD. DEV	11.75	18.87	23.75	21.77	12.58	21.57	11.40	11.18

DAY #	87	91	95	98	101	105	108	113
POS. #	OCT 18	OCT 22	OCT 26	OCT 29	NOV 1	NOV 5	NOV 8	NOV 13
	mL							
6	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-
5	142	122	-	-	-	-	-	-
8	74	80	-	-	-	-	-	-
3	142	90	124	65	78	80	70	93
7	138	129	114	90	140	124	113	146
1	145	132	159	104	153	136	126	152
11	120	76	120	66	96	100	82	90
2	140	126	146	110	142	138	124	142
4	145	120	152	102	140	140	124	148
12	117	85	136	98	140	132	118	152
AVG.	129.22	106.67	135.86	90.71	127.00	121.43	108.14	131.86
STD. DEV.	21.86	21.92	15.90	16.91	26.10	21.13	20.98	25.74
% REL. STD. DEV	16.92	20.55	11.70	18.64	20.55	17.40	19.40	19.52

TABLE D-1. Continued...

DAY #	116	119	123	126	129	133	136	140
POS. #	NOV 16	NOV 19	NOV 23	NOV 26	NOV 29	DEC 3	DEC 6	DEC 10
					mL			
6	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-
3	26	88	78	58	48	80	85	-
7	88	148	150	106	158	90	114	-
1	108	152	157	104	160	94	108	116
11	10	64	40	52	108	30	36	50
2	90	144	88	156	146	92	110	112
4	74	146	134	119	136	80	92	90
12	68	148	120	82	90	66	75	86
AVG.	66.29	127.14	109.57	96.71	120.86	76.00	88.57	90.80
STD. DEV.	33.01	33.05	39.45	33.52	38.17	20.78	25.23	23.55
% REL. STD. DEV	49.80	26.00	36.00	34.66	31.58	27.35	28.48	25.94

DAY #	143	147	150	154	158	161	165	168
POS. #	DEC 13	DEC 17	DEC 20	DEC 24	DEC 28	DEC 31	JAN 4	JAN 7
					mL			
6	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-
1	118	96	112	130	108	110	138	118
11	54	42	73	58	54	56	108	78
2	108	82	106	108	106	106	140	124
4	104	96	105	122	108	102	138	108
12	84	72	96	96	78	82	122	120
AVG.	93.60	77.60	98.40	102.80	90.80	91.20	129.20	109.60
STD. DEV.	22.68	19.98	13.69	25.25	21.64	20.06	12.43	16.66
% REL. STD. DEV	24.23	25.74	13.91	24.57	23.83	22.00	9.62	15.20

TABLE D-1. Continued...

DAY #	171	175	178	183
POS. #	JAN 10	JAN 14	JAN 17	JAN 22
	mL			
6	-	-	-	-
10	-	-	-	-
5	-	-	-	-
8	-	-	-	-
3	-	-	-	-
7	-	-	-	-
1	156	132	155	160
11	100	70	108	125
2	148	130	138	145
4	146	132	150	165
12	130	106	140	130
AVG.	136.00	114.00	138.20	145.00
STD. DEV.	19.88	24.10	16.35	15.81
% REL. STD. DEV	14.62	21.14	11.83	10.90

TABLE D-2.1 Concentrations (mg/L) of RDX residues in aqueous leachates collected from MAAP soil columns.

DAY #	3	7	10	14	17	21	24	28
POS #	JUL 26	JUL 30	AUG 2	AUG 6	AUG 9	AUG 13	AUG 16	AUG 20
	mg/L							
6	0.68	4.56	4.95	12.94	12.14	12.02	10.5	23.17
10	11.04	9.65	13.27	13.51	19.85	23.1	21.15	16.59
5	6.98	8.14	10.97	10.14	0	9.45	11.39	15.18
8	4.73	4.59	6.51	8.1	7.9	7.49	7.59	8.17
3	4.97	5.33	9.62	7.86	12.21	9.26	13.23	14.25
7	6.17	4.49	9.97	11.21	12	11.25	19.9	14.38
1	0.79	0.8	2.05	1.81	1.88	4.1	4.97	5.54
11	0.76	0.83	2.17	3.23	4.26	4.75	5.81	15.94
2	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
AVG.	4.52	4.80	7.44	8.60	8.78	10.18	11.82	14.15
STD. DEV.	3.43	2.89	3.90	4.00	6.14	5.55	5.67	5.02
%REL. STD. DEV.	76.05	60.27	52.39	46.49	69.96	54.54	47.98	35.46

DAY #	31	35	38	43	45	49	52	56
POS #	AUG 23	AUG 27	AUG 30	SEP 4	SEP 6	SEP 10	SEP 13	SEP 17
	mg/L							
6	16.8	15.35	16.17	14.23	13.1	-	-	-
10	13.33	13.42	15.83	14.23	14.8	-	-	-
5	15.13	15.29	18.19	27.46	19.94	20.55	19.8	19.35
8	8.39	10.12	10.42	11.54	11.81	16.19	15.59	14
3	10.68	11.37	14.41	10.67	9.49	10.91	12.63	10.61
7	12.71	11.72	13.54	12.09	11.98	11.88	11.69	10.76
1	6.8	6.29	7.59	7.84	8.41	9.61	9.09	9.71
11	8.17	8.87	10.36	9.11	8.92	11.57	11.61	10.83
2	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
AVG.	11.50	11.55	13.31	13.40	12.31	13.45	13.40	12.54
STD. DEV.	3.35	2.93	3.34	5.71	3.54	3.77	3.44	3.33
%REL. STD. DEV.	29.10	25.40	25.11	42.64	28.74	28.00	25.68	26.51

TABLE D-2.1 Continued...

DAY #	59	63	66	70	73	78	80	84
POS #	SEP 20	SEP 24	SEP 27	OCT 1	OCT 4	OCT 9	OCT 11	OCT 15
	----------	----------	----------	----------	mg/L	----------	----------	----------
6	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.
5	18.18	17.81	17.64	16.91	16.36	15.42	14.6	14.46
8	14.17	13.81	14.12	14.29	15.39	14.84	14.88	16.21
3	12.99	10.65	12.12	11.16	13.61	10.8	11.09	11.52
7	11.74	10.65	11.17	10.74	11.45	10.99	11.23	12.05
1	11.32	13.4	12.69	12.22	12.57	12.62	12.22	12.87
11	15.11	10.95	11.2	10.39	11.97	10.34	10.6	11.8
2	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
AVG.	13.92	12.88	13.16	12.62	13.56	12.50	12.44	13.15
STD. DEV.	2.31	2.55	2.24	2.31	1.79	1.99	1.70	1.68
%REL. STD. DEV.	16.59	19.83	17.02	18.30	13.18	15.95	13.67	12.74

DAY #	87	91	95	98	101	105	108	113
POS #	OCT 18	OCT 22	OCT 26	OCT 29	NOV 1	NOV 5	NOV 8	NOV 13
	----------	----------	----------	----------	mg/L	----------	----------	----------
6	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.
5	13.47	12.69	.	.	.	.	.	.
8	18.81	16.47	.	.	.	.	.	.
3	11.09	9.61	10.44	14.07	13.88	9.47	8.15	7.79
7	11.85	11.2	10	10.72	10.67	11.08	11.09	10.85
1	12.86	12.1	12.94	11.92	12.63	13.23	13.35	[illegible]5.5
11	12.94	11.09	11.76	10.74	10.68	12.1	11.5	11.18
2	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
AVG.	13.50	12.19	11.29	11.86	11.97	11.47	11.02	8.83
STD. DEV.	2.50	2.14	1.15	1.36	1.36	1.38	1.86	2.33
%REL. STD. DEV.	18.50	17.53	10.23	11.50	11.40	12.05	16.91	26.42

TABLE D-2.1 Continued...

DAY #	116	119	123	126	129	133	136	140
POS #	NOV 16	NOV 19	NOV 23	NOV 26	NOV 29	DEC 3	DEC 6	DEC 10
				mg/L				
6	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.
5	.	.	.	.	.	.	.	.
8	.	.	.	.	.	.	.	.
3	7.48	8.13	8.3	7.46	7.43	8.29	8.32	.
7	9.88	10.45	9.91	10.67	10.96	11.02	10.77	.
1	12.5	13.26	13.07	13.82	13	13.28	14.55	15.24
11	11.6	12.21	13.64	14.79	12.72	16.45	14.55	14.83
2	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
AVG.	10.37	11.01	11.23	11.69	11.03	12.26	12.05	15.04
STD. DEV.	1.91	1.94	2.21	2.88	2.22	3.00	2.65	0.21
%REL. STD. DEV.	18.46	17.65	19.67	24.61	20.13	24.43	21.98	1.36

DAY #	143	147	150	154	158	161	165	168
POS #	DEC 13	DEC 17	DEC 20	DEC 24	DEC 28	DEC 31	JAN 4	JAN 7
				mg/L				
6	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.
5	.	.	.	.	.	.	.	.
8	.	.	.	.	.	.	.	.
3	.	.	.	.	.	.	.	.
7	.	.	.	.	.	.	.	.
1	15	15.48	15.1	15.14	15.42	15.15	14.72	14.73
11	13.87	14.46	13.9	15	14.36	14.66	13.07	14.24
2	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
AVG.	14.44	14.97	14.50	15.07	14.89	14.91	13.90	14.49
STD. DEV.	0.56	0.51	0.60	0.07	0.53	0.24	0.82	0.24
%REL. STD. DEV.	3.91	3.41	4.14	0.46	3.56	1.64	5.94	1.69

TABLE D-2.1 Continued...

DAY #	171	175	178	183
POS #	JAN 10	JAN 14	JAN 17	JAN 22
	mg/L			
6	-	-	-	-
10	-	-	-	-
5	-	-	-	-
8	-	-	-	-
3	-	-	-	-
7	-	-	-	-
1	14.33	14.78	14.38	14.67
11	14.27	15.73	14.87	15.59
2	0	0	0	0
4	0	0	0	0
12	0	0	0	0
AVG.	14.30	15.26	14.63	15.13
STD. DEV.	0.03	0.47	0.24	0.46
%REL. STD. DEV.	0.21	3.11	1.68	3.04

TABLE D-2.2 Concentrations (mg/L) of HMX residues in aqueous leachates collected from MAAP soil columns.

DAY #	3	7	10	14	17	21	24	28
POS #	JUL 26	JUL 30	AUG 2	AUG 6	AUG 9	AUG 13	AUG 16	AUG 20
	mg/L							
#6	0	0.14	0.14	0.6	0.53	0.42	0.55	1.37
#10	0.5	0.51	0.71	0.74	1.05	0.99	1.04	0.94
#5	0.24	0.36	0.47	0.45	0.38	0.31	0.36	0.74
#8	0.21	0.16	0.29	0.28	0.24	0.21	0.22	0.2
#3	0.18	0.18	0.3	0.24	0.4	0.28	0.46	0.5
#7	0.18	0.17	0.42	0.46	0.54	0.52	0.87	0.77
#1	0	<0.14	0	<0.14	<0.14	<0.14	<0.14	<0.14
#11	<0.14	0	<0.14	<0.14	<0.14	<0.14	<0.14	0.44
#2	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#12	0	0	0	0	0	0	0	0
AVG.	0.16	0.19	0.29	0.35	0.39	0.34	0.44	0.62
STD. DEV.	0.16	0.16	0.23	0.25	0.32	0.30	0.35	0.40
%REL. STD. DEV.	97.04	84.74	78.34	72.10	80.80	87.54	80.79	65.25

DAY #	31	35	38	43	45	49	52	56
POS #	AUG 23	AUG 27	AUG 30	SEP 4	SEP 6	SEP 10	SEP 13	SEP 17
	mg/L							
#6	0.8	0.76	0.89	0.86	0.75	-	-	-
#10	0.74	0.7	0.86	0.74	0.73	-	-	-
#5	0.59	0.56	0.71	0.96	0.66	0.78	0.81	0.76
#8	0.3	0.37	0.35	0.38	0.29	0.57	0.53	0.46
#3	0.44	0.47	0.72	0.6	0.3	0.59	0.66	0.6
#7	0.7	0.63	1.12	0.68	0.63	0.7	0.69	0.58
#1	0.14	<0.14	0.17	0.14	0.15	0.14	<0.14	<0.14
#11	0.27	0.23	0.28	0.2	0.14	0.23	0.22	0.17
#2	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#12	0	0	0	0	0	0	0	0
AVG.	0.50	0.47	0.64	0.57	0.46	0.50	0.49	0.43
STD. DEV.	0.23	0.24	0.31	0.28	0.24	0.24	0.28	0.26
%REL. STD. DEV.	46.15	51.51	49.20	49.47	53.62	47.02	58.67	61.30

TABLE D-2.2 Continued...

DAY #	59	63	66	70	73	78	80	84
POS #	SEP 20	SEP 24	SEP 27	OCT 1	OCT 4	OCT 9	OCT 11	OCT 15
	mg/L							
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#5	0.72	0.68	0.82	0.75	0.82	0.8	0.75	0.97
#8	0.41	0.35	0.32	0.32	0.46	0.36	0.36	0.56
#3	0.65	0.59	0.58	0.57	0.82	0.59	0.71	0.8
#7	0.65	0.56	0.63	0.52	0.57	0.54	0.53	0.78
#1	0.16	0.16	0.18	0.15	0.17	0.18	0.15	0.23
#11	0.29	0.15	0.21	0.15	0.29	0.15	0.17	0.28
#2	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#12	0	0	0	0	0	0	0	0
AVG.	0.48	0.42	0.46	0.41	0.52	0.44	0.45	0.60
STD. DEV.	0.21	0.21	0.24	0.22	0.25	0.23	0.24	0.27
%REL. STD. DEV.	43.27	50.29	51.61	54.23	47.05	52.90	53.52	45.40

DAY #	87	91	95	98	101	105	108	113
POS #	OCT 18	OCT 22	OCT 26	OCT 29	NOV 1	NOV 5	NOV 8	NOV 13
	mg/L							
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#5	1.02	0.89	-	-	-	-	-	-
#8	0.63	0.45	-	-	-	-	-	-
#3	0.8	0.63	0.65	0.83	0.66	0.48	0.29	0.43
#7	0.81	0.71	0.78	0.48	0.5	0.66	0.47	0.65
#1	0.26	0.2	0.18	0.17	0.21	0.21	0.15	0.28
#11	0.36	0.51	0.34	0.2	0.16	0.23	0.17	0.34
#2	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#12	0	0	0	0	0	0	0	0
AVG.	0.65	0.57	0.49	0.42	0.38	0.40	0.27	0.43
STD. DEV.	0.27	0.22	0.24	0.27	0.21	0.19	0.13	0.14
%REL. STD. DEV.	40.99	38.26	49.00	63.29	53.91	47.18	47.14	33.05

TABLE D-2.2 Continued...

DAY #	116	119	123	126	129	133	136	140
POS #	NOV 16	NOV 19	NOV 23	NOV 26	NOV 29	DEC 3	DEC 6	DEC 10
	mg/L							
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#5	-	-	-	-	-	-	-	-
#8	-	-	-	-	-	-	-	-
#3	0.31	0.42	0.37	0.31	0.32	0.42	0.28	-
#7	0.71	0.83	0.81	0.68	0.92	0.68	0.8	-
#1	0.28	0.41	0.38	0.36	0.52	0.37	0.31	0.41
#11	0.36	0.32	0.34	0.66	0.62	0.56	0.43	0.36
#2	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#12	0	0	0	0	0	0	0	0
AVG.	0.42	0.50	0.48	0.50	0.60	0.51	0.46	0.39
STD. DEV.	0.17	0.20	0.19	0.17	0.22	0.12	0.21	0.02
%REL. STD. DEV.	41.61	39.86	40.84	33.55	36.39	23.95	45.48	6.49

DAY #	143	147	150	154	158	161	165	168
POS #	DEC 13	DEC 17	DEC 20	DEC 24	DEC 28	D[illegible]	JAN 4	JAN 7
	mg/L							
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#5	-	-	-	-	-	-	-	-
#8	-	-	-	-	-	-	-	-
#3	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#1	0.42	0.38	0.42	0.45	0.41	0.42	0.5	0.45
#11	0.29	0.25	0.28	0.32	0.29	0.28	0.39	0.35
#2	0	0	0	0	0	0	0	0
#4	0	0	0	0	0	0	0	0
#12	0	0	0	0	0	0	0	0
AVG.	0.36	0.32	0.35	0.39	0.35	0.35	0.45	0.40
STD. DEV.	0.06	0.06	0.07	0.06	0.06	0.07	0.06	0.05
%REL. STD. DEV.	18.31	20.63	20.00	16.88	17.14	20.00	12.36	12.50

TABLE D-2.2 Continued...

DAY #	171	175	178	183
POS #	JAN 10	JAN 14	JAN 17	JAN 22
	---------------mg/L	---------------		
#6	-	-	-	-
#10	-	-	-	-
#5	-	-	-	-
#8	-	-	-	-
#3	-	-	-	-
#7	-	-	-	-
#1	0.52	0.45	0.51	0.56
#11	0.38	0.31	0.4	0.37
#2	0	0	0	0
#4	0	0	0	0
#12	0	0	0	0
AVG.	0.45	0.38	0.46	0.47
STD. DEV.	0.07	0.07	0.06	0.10
%REL. STD. DEV.	15.56	18.42	12.09	20.43

TABLE D-2.3 Concentrations (mg/L) of 2,4-DNT residues in aqueous leachates collected from MAAP soil columns.

DAY #	3	7	10	14	17	21	24	28
POS #	JUL 26	JUL 30	AUG 2	AUG 6	AUG 9	AUG 13	AUG 16	AUG 20
					mL			
6	<0.17	0.44	0.34	0.61	0.65	0.71	0.75	1.12
10	4.5	1.61	1.92	1.54	1.13	1.14	1.52	1.14
5	0.57	0.55	1.15	0.92	0.89	0.7	0.69	0.8
8	1.3	0.74	1.14	1.21	0.84	0.87	0.81	0.67
3	1.27	0.67	1.16	0.7	1.04	0.67	0.86	0.85
7	1.52	0.42	0.93	0.35	0.82	0.67	0.55	0.76
1	0.18	<0.17	<0.17	<0.17	0.17	<0.17	0.2	0.21
11	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	0.64
2	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0
AVG.	1.17	0.55	0.83	0.67	0.69	0.60	0.67	0.77
STD. DEV.	1.38	0.48	0.62	0.51	0.38	0.37	0.43	0.28
%REL. STD. DEV.	118.51	85.85	75.28	77.19	54.60	62.78	63.72	35.61

DAY #	31	35	38	43	45	49	52	56
POS #	AUG 23	AUG 27	AUG 30	SEP 4	SEP 6	SEP 10	SEP 13	SEP 17
					mL			
6	0.84	0.69	0.69	0.61	0.58	-	-	-
10	0.92	0.87	0.87	0.72	0.71	-	-	-
5	0.69	0.62	0.73	0.36	0.63	0.66	0.68	0.67
8	0.70	0.73	0.68	0.60	0.67	0.81	0.76	0.67
3	0.63	0.56	0.69	0.46	0.46	0.45	0.49	0.38
7	0.73	0.61	0.64	0.51	0.41	0.44	0.39	0.55
1	<0.17	0.19	0.21	0.17	0.05	<0.17	0.18	<0.17
11	0.19	<0.17	<0.17	<0.17	<0.17	0.19	<0.17	<0.17
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.59	0.53	0.56	0.43	0.44	0.43	0.42	0.38
STD. DEV.	0.30	0.27	0.28	0.23	0.26	0.27	0.27	0.28
%REL. STD. DEV.	51.16	51.01	49.21	52.81	58.58	63.73	63.72	75.22

TABLE D-2.3 Continued...

DAY #	59	63	66	70	73	78	80	84
POS #	SEP 20	SEP 24	SEP 27	OCT 1	OCT 4	OCT 9	OCT 11	OCT 15
	mL							
6	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.
5	0.62	0.66	0.60	0.64	0.65	0.64	0.55	0.58
8	0.70	0.68	0.54	0.58	0.69	0.69	0.61	0.61
3	0.44	0.35	0.32	0.32	0.40	0.33	0.32	0.29
7	0.38	0.33	0.31	0.29	0.29	0.29	0.24	0.30
1	0.22	0.20	<0.17	0.21	0.21	0.22	0.20	<0.17
11	0.20	<0.17	<0.17	<0.17	0.18	<0.17	<0.17	<0.17
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.43	0.37	0.30	0.34	0.40	0.36	0.32	0.30
STD. DEV.	0.19	0.24	0.23	0.22	0.20	0.24	0.21	0.24
%REL. STD. DEV.	43.69	65.09	79.25	63.88	49.91	66.04	65.08	81.94

DAY #	87	91	95	98	101	105	108	113
POS #	OCT 18	OCT 22	OCT 26	OCT 29	NOV 1	NOV 5	NOV 8	NOV 13
	mL							
6	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.
5	0.46	0.59	.	.	.	.	.	.
8	0.59	0.63	.	.	.	.	.	.
3	0.27	0.20	0.24	<0.17	0.17	0.18	0.18	<0.17
7	0.26	0.26	0.21	0.20	0.55	0.25	0.25	<0.17
1	<0.17	0.20	0.20	<0.17	<0.17	0.20	0.22	<0.17
11	<0.17	0.20	<0.17	<0.17	0.35	<0.17	0.18	<0.17
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.26	0.35	0.16	0.05	0.27	0.16	0.21	0.00
STD. DEV.	0.22	0.19	0.09	0.09	0.20	0.09	0.03	0.00
%REL. STD. DEV.	82.64	54.16	58.44	173.21	76.54	59.96	14.20	0.00

TABLE D-2.3 Continued...

DAY #	116	119	123	126	129	133	136	140
POS #	NOV 16	NOV 19	NOV 23	NOV 26	NOV 29	DEC 3	DEC 6	DEC 10
	mL							
6	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.
5	.	.	.	.	.	.	.	.
8	.	.	.	.	.	.	.	.
3	<0.17	<0.17	<0.17	0.00	0.00	0.00	0.00	.
7	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	.
1	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17
11	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%REL. STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DAY #	143	147	150	154	158	161	165	168
POS #	DEC 13	DEC 17	DEC 20	DEC 24	DEC 28	DEC 31	JAN 4	JAN 7
	mL							
6	.	.	.	.	.	.	.	.
10	.	.	.	.	.	.	.	.
5	.	.	.	.	.	.	.	.
8	.	.	.	.	.	.	.	.
3	.	.	.	.	.	.	.	.
7	.	.	.	.	.	.	.	.
1	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17
11	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%REL. STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TABLE D-2.3 Continued...

DAY #	171	175	178	183
POS #	JAN 10	JAN 14	JAN 17	JAN 22
	mL			
6	-	-	-	-
10	-	-	-	-
5	-	-	-	-
8	-	-	-	-
3	-	-	-	-
7	-	-	-	-
1	<0.17	<0.17	<0.17	<0.17
11	<0.17	<0.17	<0.17	<0.17
2	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	0.00
%REL. STD. DEV.	0.00	0.00	0.00	0.00

TABLE D-2.4 Concentrations (mg/L) of 2,6-DNT residues in aqueous leachates collected from MAAP soil columns.

DAY #	3	7	10	14	17	21	24	28
POS #	JUL 26	JUL 30	AUG 2	AUG 6	AUG 9	AUG 13	AUG 16	AUG 20
					mL			
6	0.44	1.06	0.94	0.96	1.07	0.97	1.02	0.44
10	3.68	1.58	1.45	1.46	0.47	0.48	1.13	1.09
5	1.34	0.97	<0.37	1.05	1.09	0.55	1.00	0.98
8	1.21	1.21	1.22	1.36	1.18	1.23	1.13	1.07
3	1.34	0.71	1.00	0.65	1.16	<0.37	3.72	0.67
7	1.99	0.74	0.98	<0.37	0.85	0.69	2.12	0.61
1	<0.37	<0.37	1.28	<0.37	<0.37	0.00	<0.37	<0.37
11	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	0.64
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	1.25	0.78	0.86	0.69	0.73	0.49	1.27	0.69
STD. DEV.	1.13	0.52	0.52	0.58	0.47	0.44	1.13	0.34
%REL. STD. DEV.	90.56	66.34	60.70	84.40	64.84	89.60	88.93	49.76

DAY #	31	35	38	43	45	49	52	56
POS #	AUG 23	AUG 27	AUG 30	SEP 4	SEP 6	SEP 10	SEP 13	SEP 17
					mL			
6	0.93	0.76	0.70	0.45	0.64	-	-	-
10	0.91	0.93	0.71	0.71	0.70	-	-	-
5	1.03	0.88	0.93	<0.37	0.73	0.67	0.70	0.58
8	1.06	0.98	0.65	0.88	0.87	0.83	0.81	0.75
3	0.41	0.56	<0.37	<0.37	<0.37	<0.37	0.44	<0.37
7	0.61	0.61	0.53	0.47	0.41	0.43	0.41	0.40
1	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37
11	<0.37	<0.37	<0.37	<0.37	<0.37	0.44	0.38	<0.37
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.62	0.59	0.44	0.31	0.42	0.40	0.46	0.29
STD. DEV.	0.41	0.37	0.36	0.34	0.35	0.31	0.26	0.31
%REL. STD. DEV.	66.51	62.22	80.90	107.75	82.50	78.72	56.61	105.96

TABLE D-2.4 Continued...

DAY #	59	63	66	70	73	78	80	84
POS #	SEP 20	SEP 24	SEP 27	OCT 1	OCT 4	OCT 9	OCT 11	OCT 15
	mL							
6	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-
5	0.60	0.59	0.49	<0.37	0.52	0.46	0.39	0.41
8	0.78	0.75	0.62	0.62	0.65	0.70	0.58	0.54
3	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37
7	0.44	0.44	<0.37	0.45	0.39	0.40	<0.37	0.39
1	0.37	0.37	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37
11	0.40	0.38	<0.37	<0.37	<0.37	0.37	<0.37	<0.37
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.43	0.42	0.19	0.18	0.26	0.32	0.16	0.22
STD. DEV.	0.24	0.23	0.26	0.26	0.27	0.25	0.24	0.23
%REL. STD. DEV.	55.22	54.66	142.87	144.07	104.08	78.00	145.43	102.19

DAY #	87	91	95	98	101	105	108	113
POS #	OCT 18	OCT 22	OCT 26	OCT 29	NOV 1	NOV 5	NOV 8	NOV 13
	mL							
6	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-
5	<0.37	<0.37	-	-	-	-	-	-
8	<0.37	<0.37	-	-	-	-	-	-
3	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37
7	<0.37	<0.37	<0.37	<0.37	0.46	<0.37	<0.37	<0.37
1	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37
11	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00
%REL. STD. DEV.	0.00	0.00	0.00	0.00	173.21	0.00	0.00	0.00

TABLE D-2.4 Continued...

DAY #	116	119	123	126	129	133	136	140
POS #	NOV 16	NOV 19	NOV 23	NOV 26	NOV 29	DEC 3	DEC 6	DEC 10
	mL							
6	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-
3	<0.37	<0.37	<0.37	<0.37	0.00	0.00	<0.37	-
7	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	-
1	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37
11	<0.37	<0.37	<0.37	<0.37	0.45	<0.37	<0.37	<0.37
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	0.00	0.19	0.00	0.00	0.00
%REL. STD. DEV.	0.00	0.00	0.00	0.00	173.21	0.00	0.00	0.00

DAY #	143	147	150	154	158	161	165	168
POS #	DEC 13	DEC 17	DEC 20	DEC 24	DEC 28	DEC 31	JAN 4	JAN 7
	mL							
6	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-
1	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37
11	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37	<0.37
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%REL. STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TABLE D-2.4 Continued...

DAY #	171	175	178	183
POS #	JAN 10	JAN 14	JAN 17	JAN 22
	---------------mL---------------			
6	-	-	-	-
10	-	-	-	-
5	-	-	-	-
8	-	-	-	-
3	-	-	-	-
7	-	-	-	-
1	<0.37	<0.37	<0.37	<0.37
11	<0.37	<0.37	<0.37	<0.37
2	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	0.00
%REL. STD. DEV.	0.00	0 00	0.00	0.00

TABLE D-2.5 Concentrations (mg/L) of TNT residues in aqueous leachates collected from MAAP soil columns.

DAY #	3	7	10	14	17	21	24	28
POS #	JUL 26	JUL 30	AUG 2	AUG 6	AUG 9	AUG 13	AUG 16	AUG 20
	mg/L							
6	0.00	<0.09	0.09	<0.09	<0.09	0.00	<0.09	<0.09
10	0.21	0.17	0.12	<0.09	<0.09	<0.09	<0.09	<0.09
5	0.12	0.12	<0.09	<0.09	<0.09	0.00	<0.09	<0.09
8	0.14	<0.09	<0.09	0.00	<0.09	0.00	0.00	<0.09
3	0.09	0.11	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09
7	0.14	0.09	<0.09	0.00	<0.09	<0.09	0.00	<0.09
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	<0.09
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.09	0.06	0.03	0.00	0.00	0.00	0.00	0.00
STD. DEV.	0.07	0.06	0.05	0.00	0.00	0.00	0.00	0.00
%REL. STD. DEV.	0.85	1.06	1.76	0.00	0.00	0.00	0.00	0.00

DAY #	31	35	38	43	45	49	52	56
POS #	AUG 23	AUG 27	AUG 30	SEP 4	SEP 6	SEP 10	SEP 13	SEP 17
	mg/L							
6	<0.09	<0.09	<0.09	0.00	<0.09	-	-	-
10	<0.09	<0.09	0.00	<0.09	<0.09	-	-	-
5	0.00	0.00	0.00	0.00	<0.09	<0.09	<0.09	<0.09
8	0.00	<0.09	0.00	0.00	<0.09	<0.09	<0.09	<0.09
3	<0.09	<0.09	0.00	0.00	<0.09	<0.09	0.00	<0.09
7	<0.09	<0.09	0.00	0.00	<0.09	<0.09	<0.09	<0.09
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%REL. STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TABLE D-2.5 Continued..

DAY #	59	63	66	70	73	78	80	84
POS #	SEP 20	SEP 24	SEP 27	OCT 1	OCT 4	OCT 9	OCT 11	OCT 15
	mg/L							
6	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-
5	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	0.00	0.00
8	<0.09	<0.09	<0.09	<0.09	<0.09	<0.09	0.00	0.00
3	<0.09	0.00	<0.09	0.00	<0.09	<0.09	0.00	0.00
7	<0.09	0.00	<0.09	<0.09	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%REL. STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DAY #	87	91	95	98	101	105	108	113
POS #	OCT 18	OCT 22	OCT 26	OCT 29	NOV 1	NOV 5	NOV 8	NOV 13
	mg/L							
6	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-
5	0.00	0.00	-	-	-	-	-	-
8	0.00	0.00	-	-	-	-	-	-
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%REL. STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TABLE D-2.5 Continued..

DAY #	116	119	123	126	129	133	136	140
POS #	NOV 16	NOV 19	NOV 23	NOV 26	NOV 29	DEC 3	DEC 6	DEC 10
	mg/L							
6	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%REL. STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DAY #	143	147	150	154	158	161	165	168
POS #	DEC 13	DEC 17	DEC 20	DEC 24	DEC 28	DEC 31	JAN 4	JAN 7
	mg/L							
6	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%REL. STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TABLE D-2.5 Continued..

DAY #	171	175	178	183
POS #	JAN 10	JAN 14	JAN 17	JAN 22
	mg/L			
6	.	.	.	.
10	.	.	.	.
5	.	.	.	.
8	.	.	.	.
3	.	.	.	.
7	.	.	.	.
1	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	0.00
%REL. STD. DEV.	0.00	0.00	0.00	0.00

TABLE D-3.1 Amounts (ug) of RDX residues in aqueous leachates collected from MAAP soil columns.

DAY #	3	7	10	14	17	21	24	28
POS #	JUL 26	JUL 30	AUG 2	AUG 6	AUG 9	AUG 13	AUG 16	AUG 20
	ug							
#6	44.20	346.56	356.40	1526.92	1408.24	1622.70	1176.00	4332.79
#10	1490.40	656.20	1618.94	1148.35	1230.70	1686.30	3066.75	1642.41
#5	1060.96	781.44	1491.92	1338.48	0.00	1266.30	1526.26	4174.50
#8	553.41	339.66	963.48	842.40	1019.10	876.33	895.62	866.02
#3	665.98	357.11	1346.80	754.56	1611.72	981.56	1666.98	1653.00
#7	950.18	395.12	1635.08	762.28	1824.00	1518.75	1671.60	1840.64
#1	118.50	67.20	352.60	217.20	289.52	569.90	685.86	736.82
#11	91.96	61.42	251.72	316.54	536.76	560.50	685.58	4303.80
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	621.95	375.59	1002.12	863.34	990.01	1135.29	1421.83	2443.75
STD. DEV.	491.10	234.55	563.83	431.03	611.56	425.17	729.74	1460.21
%REL. STD. DEV.	78.96	62.45	56.26	49.93	61.77	37.45	51.32	59.75

DAY #	31	35	38	43	45	49	52	56
POS #	AUG 23	AUG 27	AUG 30	SEP 4	SEP 6	SEP 10	SEP 13	SEP 17
	ug							
#6	2856.00	1638.50	1908.06	1451.46	1021.80	-	-	-
#10	1466.30	1234.64	1677.98	1138.40	1765.60		-	-
#5	2360.28	2018.28	2546.60	988.56	2332.98	3082.50	2455.20	2399.40
#8	1208.16	1113.20	1333.76	1177.08	992.04	2039.94	1403.10	1288.00
#3	1345.68	1182.48	1873.30	1067.00	665.32	1440.12	1439.82	1145.88
#7	2033.60	1453.28	2085.16	1668.42	1305.82	1972.08	1589.84	1334.24
#1	1020.00	868.02	1153.68	1066.24	899.87	1652.92	1072.62	1204.04
#11	1094.78	975.70	1160.32	1020.32	660.08	1596.66	1230.66	1018.02
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	1673.10	1516.76	1717.36	1157.19	1115.44	1564.06	1531.87	1398.26
STD. DEV.	625.9[illegible]	[illegible]	[illegible]	223.46	502.49	[illegible]	[illegible]	[illegible]
%REL. STD. DEV.	37.38	[illegible]	26.53	18.67	45.05	[illegible]	[illegible]	[illegible]

TABLE D-3.1 Continued...

DAY #	59	63	66	70	73	78	80	84
POS #	SEP 20	SEP 24	SEP 27	OCT 1	OCT 4	OCT 9	OCT 11	OCT 15
	ug							
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#5	2399.76	2760.55	1234.80	1860.10	1930.48	1942.92	1489.20	2082.24
#8	1417.00	1242.90	649.52	800.24	1231.20	801.36	1071.36	1734.47
#3	1688.70	1533.60	969.60	1205.28	1578.76	1188.00	1031.37	1589.76
#7	1573.16	1522.95	1027.64	1181.40	1396.90	1450.68	1066.85	1747.25
#1	1584.80	1956.40	1319.76	1490.84	1634.10	1716.32	1246.44	1981.98
#11	1541.22	963.60	649.60	706.52	1220.94	951.28	795.00	1368.80
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	1700.77	1663.33	975.15	1207.40	1498.73	1341.76	1116.70	17[illegible]0.75
STD. DEV.	322.61	576.30	258.51	392.36	248.41	404.50	212.49	236.44
%REL. STD. DEV.	18.97	34.65	26.51	32.50	16.57	30.15	19.03	13.51

DAY #	87	91	95	98	101	105	108	113
POS #	OCT 18	OCT 22	OCT 26	OCT 29	NOV 1	NOV 5	NOV 8	NOV 13
	ug							
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#5	1912.74	1548.18	-	-	-	-	-	-
#8	1391.94	1317.60	-	-	-	-	-	-
#3	1574.78	864.90	1294.56	914.55	1082.64	757.60	570.50	724.47
#7	1635.30	1444.80	1140.00	964.80	1493.80	1373.92	1253.17	1584.10
#1	578.70	1597.20	2057.46	1239.68	1932.39	1799.28	1682.10	836.00
#11	1552.80	842.84	1411.20	708.84	1025.28	1210.00	943.00	1006.20
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	1441.04	1269.25	1475.81	956.97	1383.53	1285.20	1112.19	1037.69
STD. DEV.	415.66	306.55	349.32	189.31	364.79	372.88	408.27	331.04
%REL. STD. DEV.	28.84	24.15	23.67	19.78	26.37	29.01	36.71	31.90

TABLE D-3.1 Continued...

DAY #	116	119	123	126	129	133	136	140
POS #	NOV 16	NOV 19	NOV 23	NOV 26	NOV 29	DEC 3	DEC 6	DEC 10
	ug							
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#5	-	-	-	-	-	-	-	-
#8	-	-	-	-	-	-	-	-
#3	194.48	715.44	647.40	432.68	356.64	663.20	707.20	-
#7	869.44	1546.60	1486.50	1131.02	1731.68	991.80	1227.78	-
#1	1350.00	2015.52	2051.99	1437.28	2080.00	1248.32	1571.40	1767.84
#11	116.00	781.44	682.00	769.08	1373.76	493.50	523.80	741.50
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	632.48	1264.75	1216.97	942.52	1385.52	849.20	1007.55	1254.67
STD. DEV.	507.34	542.78	587.48	377.60	644.37	291.87	415.53	513.17
%REL. STD. DEV.	80.21	42.92	48.27	40.06	46.51	34.37	41.24	40.90

DAY #	143	147	150	154	158	161	165	168
POS #	DEC 13	DEC 17	DEC 20	DEC 24	DEC 28	DEC 31	JAN 4	JAN 7
	ug							
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#5	-	-	-	-	-	-	-	-
#8	-	-	-	-	-	-	-	-
#3	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#1	1770.00	1486.08	1691.20	1968.20	1665.36	1666.50	2031.36	1738.14
#11	748.98	607.32	1014.70	870.00	775.44	820.96	1411.56	1110.72
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12								
AVG.	1259.49	1046.70	1352.95	1419.10	1220.40	1243.73	1721.46	1424.43
STD. DEV.	510.51	439.38	338.25	549.10	444.96	422.77	309.90	313.71
%REL. STD. DEV.	40.53	41.98	25.00	38.69	36.46	33.99	18.00	22.02

TABLE D-3.1 Continued...

DAY #	171	175	178	183
POS #	JAN 10	JAN 14	JAN 17	JAN 22
	ug			
#6	-	-	-	-
#10	-	-	-	-
#5	-	-	-	-
#8	-	-	-	-
#3	-	-	-	-
#7	-	-	-	-
#1	2235.48	1950.96	2228.90	2347.20
#11	1427.00	1101.10	1605.96	1948.75
#2	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00
#12				
AVG.	1831.24	1526.03	1917.43	2147.98
STD. DEV.	404.24	424.93	311.47	199.23
%REL. STD. DEV.	22.07	27.85	16.24	9.28

TABLE D-3.2 Amount (ug) of HMX residues in aqueous leachates collected from MAAP soil columns.

DAY #	3	7	10	14	17	21	24	28
POS #	JUL 26	JUL 30	AUG 2	AUG 6	AUG 9	AUG 13	AUG 16	AUG 20
	ug							
#6	0.00	10.64	10.08	70.80	61.48	56.70	61.60	256.19
#10	67.50	34.68	86.62	62.90	65.10	72.27	150.80	93.06
#5	36.48	34.56	63.92	59.40	52.06	41.54	48.24	203.50
#8	24.57	11.84	42.92	29.12	30.96	24.57	25.96	21.20
#3	24.12	12.06	42.00	23.04	52.80	29.68	57.96	58.00
#7	27.72	14.96	68.88	31.28	82.08	70.20	73.08	98.56
#1	0.00	*	0.00	*	*	*	*	*
#11	*	0.00	*	*	*	*	*	118.80
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	22.55	14.84	39.30	34.57	43.06	36.87	52.21	106.16
STD. DEV.	21.72	12.54	30.99	25.73	28.24	26.69	45.32	81.53
%REL. STD. DEV.	96.32	84.46	78.85	74.43	65.57	72.40	86.82	76.80

DAY #	31	35	38	43	45	49	52	56
POS #	AUG 23	AUG 27	AUG 30	SEP 4	SEP 6	SEP 10	SEP 13	SEP 17
	ug							
#6	136.00	83.60	105.02	87.72	58.50	1872.00	-	-
#10	81.40	64.40	91.16	59.20	52.56	1681.92	-	-
#5	92.04	73.92	99.40	34.56	77.22	117.00	100.44	94.24
#8	43.20	40.70	44.80	38.76	24.36	71.82	47.70	42.32
#3	55.44	48.88	93.60	60.00	20.40	77.88	75.24	64.80
#7	112.00	78.12	172.48	93.84	68.67	116.20	93.84	71.92
#1	21.00	*	25.84	19.04	16.05	24.08	*	*
#11	36.18	25.30	31.36	22.40	10.36	31.74	23.32	15.98
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	72.16	51.87	82.96	51.94	41.02	499.08	56.76	48.21
STD. DEV.	37.37	27.09	45.18	26.42	24.44	739.98	36.62	32.54
%REL. STD. DEV.	51.79	52.22	54.47	50.87	59.60	148.27	64.52	67.50

TABLE D-3.2 Continued..

DAY #	59	63	66	70	73	78	80	84
POS #	SEP 20	SEP 24	SEP 27	OCT 1	OCT 4	OCT 9	OCT 11	OCT 15
	ug							
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#5	95.04	105.40	57.40	82.50	96.76	100.80	76.50	139.68
#8	41.00	31.50	14.72	17.92	36.80	19.44	25.92	59.92
#3	84.50	84.96	46.40	61.56	95.12	64.90	66.03	110.40
#7	87.10	80.08	57.96	57.20	69.54	71.28	50.35	113.10
#1	22.40	23.36	18.72	18.30	22.10	24.48	15.30	35.42
#11	29.58	13.20	12.18	10.20	29.58	13.80	12.75	32.48
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	59.94	56.42	34.56	41.28	58.32	49.12	41.14	81.83
STD. DEV.	29.62	35.01	19.81	27.09	30.44	32.01	24.70	41.25
%REL. STD. DEV.	49.41	62.06	57.32	65.63	52.19	65.16	60.03	50.41

DAY #	87	91	95	98	101	105	108	113
POS #	OCT 18	OCT 22	OCT 26	OCT 29	NOV 1	NOV 5	NOV 8	NOV 13
	ug							
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#5	144.84	108.58	0.00	-	-	-	-	-
#8	46.62	36.00	4068.00	-	-	-	-	-
#3	113.60	56.70	80.60	53.95	51.48	38.40	20.30	39.99
#7	111.78	91.59	88.92	43.20	70.00	81.84	53.11	94.90
#1	11.70	26.40	28.62	17.68	32.13	28.56	18.90	42.56
#11	43.20	38.76	40.80	13.20	0.00	23.00	13.94	30.60
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	78.62	59.67	717.82	32.01	38.40	42.95	26.56	52.01
STD. DEV.	47.37	30.34	1498.55	17.07	25.90	23.12	15.51	25.16
%REL. STD. DEV.	60.25	50.85	208.76	53.34	67.45	53.83	58.38	48.37

TABLE D-3.2 Continued..

DAY #	116	119	123	126	129	133	136	140
POS #	NOV 16	NOV 19	NOV 23	NOV 26	NOV 29	DEC 3	DEC 6	DEC 10
	ug							
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#5	-	-	-	-	-	-	-	-
#8	-	-	-	-	-	-	-	-
#3	8.06	36.96	28.86	17.98	15.36	33.60	23.80	2665.60
#7	62.48	122.84	121.50	72.08	145.36	61.20	91.20	10214.40
#1	30.24	62.32	59.66	37.44	83.20	34.78	33.48	47.56
#11	3.60	20.48	17.00	34.32	66.96	16.80	15.48	18.00
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	26.10	60.65	56.76	40.46	77.72	36.60	40.99	3236.39
STD. DEV.	23.30	38.88	40.49	19.70	46.39	15.89	29.68	4169.69
%REL. STD. DEV.	89.31	64.10	71.35	48.69	59.69	43.41	72.41	128.84

DAY #	143	147	150	154	158	161	165	168
POS #	DEC 13	DEC 17	DEC 20	DEC 24	DEC 28	DEC 31	JAN 4	JAN 7
	ug							
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#5	-	-	-	-	-	-	-	-
#8	-	-	-	-	-	-	-	-
#3	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#1	49.56	36.48	47.04	58.50	44.28	46.20	69.00	53.10
#11	15.66	10.50	20.44	18.56	15.66	15.68	42.12	27.30
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	32.61	23.49	33.74	38.53	29.97	30.94	55.56	40.20
STD. DEV.	16.95	12.99	13.30	19.97	14.31	15.26	13.44	12.90
%REL. STD. DEV.	51.98	55.30	39.42	51.83	47.75	49.32	24.19	32.09

TABLE D-3.2 Continued...

DAY #	171	175	178	183
POS #	JAN 10	JAN 14	JAN 17	JAN 22
	---------------ug---------------			
#6	-	-	-	-
#10	-	-	-	-
#5	-	-	-	-
#8	-	-	-	-
#3	-	-	-	-
#7	-	-	-	-
#1	81.12	59.40	79.05	89.60
#11	38.00	21.70	43.20	46.25
#2	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00
AVG.	59.56	40.55	61.13	67.93
STD. DEV.	21.56	18.85	17.93	21.67
%REL. STD. DEV.	36.20	46.49	29.33	31.91

TABLE D-3.3 Amounts (ug) of 2,4-DNT residues in aqueous leachates collected collected from MAAP soil columns.

DAY #	3	7	10	14	17	21	24	28
POS #	JUL 26	JUL 30	AUG 2	AUG 6	AUG 9	AUG 13	AUG 16	AUG 20
	ug							
#6	*	33.44	24.48	71.98	75.40	95.85	84.00	209.44
#10	607.50	109.48	234.24	130.90	70.06	83.22	220.40	112.86
#5	86.64	52.80	156.40	121.44	121.93	93.80	92.46	220.00
#8	152.10	54.76	168.72	125.84	108.36	101.79	95.58	71.02
#3	170.18	44.89	162.40	67.20	137.28	71.02	108.36	98.60
#7	234.08	36.96	152.52	23.80	124.64	90.45	46.20	97.28
#1	27.00	*	*	*	26.18	*	27.60	27.93
#11	*	*	*	*	*	*	*	172.80
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	159.69	41.54	112.35	67.65	82.98	67.02	84.33	126.24
STD. DEV.	187.14	32.53	84.45	51.69	46.34	39.64	62.32	63.62
%REL. STD. DEV.	117.19	78.31	75.17	76.41	55.85	59.14	73.90	50.39

DAY #	31	35	38	43	45	49	52	56
POS #	AUG 23	AUG 27	AUG 30	SEP 4	SEP 6	SEP 10	SEP 13	SEP 17
	ug							
#6	142.80	75.90	81.42	62.22	45.24	-	-	-
#10	101.20	80.04	92.22	57.60	51.12	-	-	-
#5	107.64	81.84	102.20	12.96	73.71	99.00	84.32	83.08
#8	100.80	80.30	87.04	61.20	56.28	102.06	68.40	61.64
#3	79.38	58.24	89.70	46.00	31.28	59.40	55.86	41.04
#7	116.80	75.64	98.56	70.38	44.69	73.04	53.04	68.20
#1	*	26.22	31.92	23.12	5.35	*	21.24	*
#11	25.46	*	*	*	*	26.22	*	*
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	84.26	59.77	72.88	41.69	38.46	59.95	47.14	42.33
STD. DEV.	44.96	28.57	34.35	24.51	23.54	36.97	28.40	32.37
%REL. STD. DEV.	53.36	47.80	47.13	58.79	61.20	61.67	60.23	76.48

TABLE D-3.3 Continued...

DAY #	59	63	66	70	73	78	80	84
POS #	SEP 20	SEP 24	SEP 27	OCT 1	OCT 4	OCT 9	OCT 11	OCT 15
	ug							
#6	.	.	.	.	.	.	.	.
#10	.	.	.	.	.	.	.	.
#5	81.84	102.30	42.00	70.40	76.70	80.64	56.10	83.52
#8	70.00	61.20	24.84	32.48	55.20	37.26	43.92	65.27
#3	57.20	50.40	25.60	34.56	46.40	36.30	29.76	40.02
#7	50.92	47.19	28.52	31.90	35.38	38.28	22.80	43.50
#1	30.80	29.20	*	25.62	27.30	29.92	20.40	*
#11	20.40	*	*	*	18.36	*	*	*
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	51 86	48.38	20.16	32.49	43.22	37.07	28.83	38.72
STD. DEV.	21.18	31.05	15.34	20.59	19.18	23.54	17.85	30.92
%REL. STD. DEV.	40.83	64.18	76.07	63.38	44.38	63.52	61.90	79.85

DAY #	87	91	95	98	101	105	108	113
POS #	OCT 18	OCT 22	OCT 26	OCT 29	NOV 1	NOV 5	NOV 8	NOV 13
	ug							
#6	.	.	.	.	.	.	.	.
#10	.	.	.	.	.	.	.	.
#5	65.32	71.98	.	.	.	.	.	.
#8	43.66	50.40	.	.	.	.	.	.
#3	38.34	18.00	29.76	*	13.26	14.40	12.60	*
#7	35.88	33.54	23.94	18.00	77.00	31.00	28.25	*
#1	*	26.40	31.80	*	*	27.20	27.72	*
#11	*	15.20	*	*	33.60	*	14.76	*
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	30.53	35.92	21.38	4.50	30.97	18.15	20.83	0.00
STD. DEV.	23.58	19.82	12.67	7.79	29.15	12.15	7.20	0.00
%REL. STD. DEV.	77.23	55.18	59.29	173.21	94.13	66.94	34.54	0.00

TABLE D-3.3 Continued...

DAY #	116	119	123	126	129	133	136	140
POS #	NOV 16	NOV 19	NOV 23	NOV 26	NOV 29	DEC 3	DEC 6	DEC 10
	ug							
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#5	-	-	-	-	-	-	-	-
#8	-	-	-	-	-	-	-	-
#3	*	*	*	*	*	*	*	-
#7	*	*	*	*	*	*	*	-
#1	*	*	*	*	*	*	*	*
#11	*	*	*	*	*	*	*	*
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%REL. STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DAY #	143	147	150	154	158	161	165	168
POS #	DEC 13	DEC 17	DEC 20	DEC 24	DEC 28	DEC 31	JAN 4	JAN 7
	ug							
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#5	-	-	-	-	-	-	-	-
#8	-	-	-	-	-	-	-	-
#3	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#1	*	*	*	*	*	*	*	*
#11	*	*	*	*	*	*	*	*
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%REL. STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TABLE D-3.3 Continued...

DAY #	171	175	178	183
POS #	JAN 10	JAN 14	JAN 17	JAN 22
	---------------ug---------------			
#6	-	-	-	-
#10	-	-	-	-
#5	-	-	-	-
#8	-	-	-	-
#3	-	-	-	-
#7	-	-	-	-
#1	*	*	*	*
#11	*	*	*	*
#2	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	0.00
%REL. STD. DEV.	0.00	0.00	0.00	0.00

TABLE D-3.4 Amounts (ug) of 2,6-DNT residues in aqueous leachates collected from MAAP soil columns.

DAY #	3	7	10	14	17	21	24	28
POS #	JUL 26	JUL 30	AUG 2	AUG 6	AUG 9	AUG 13	AUG 16	AUG 20
					mL			
#6	28.60	80.56	67.68	113.28	124.12	130.95	114.24	82.28
#10	496.80	107.44	176.90	124.10	29.14	35.04	163.85	107.91
#5	203.68	93.12	*	138.60	149.33	73.70	134.00	269.50
#8	141.57	89.54	180.56	141.44	152.22	143.91	133.34	113.42
#3	179.56	47.57	140.00	62.40	153.12	*	468.72	77.72
#7	306.46	65.12	160.72	*	129.20	93.15	178.08	78.08
#1	*	*	220.16	*	*	0.00	*	*
#11	*	*	*	*	*	*	*	172.80
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	169.58	60.42	118.25	72.48	92.14	59.59	149.03	112.71
STD. DEV.	160.17	38.77	79.46	60.54	65.14	55.66	136.64	74.39
%REL. STD. DEV.	94.45	64.16	67.19	83.53	70.69	93.40	91.69	66.00

DAY #	31	35	38	43	45	49	52	56
POS #	AUG 23	AUG 27	AUG 30	SEP 4	SEP 6	SEP 10	SEP 13	SEP 17
					mL			
#6	158.10	83.60	82.60	45.90	49.92	-	-	-
#10	100.10	85.56	75.26	56.80	50.40	-	-	-
#5	160.68	116.16	130.20	*	85.41	100.50	86.80	71.92
#8	152.64	107.80	83.20	89.76	73.08	104.58	72.90	69.00
#3	51.66	58.24	*	*	*	*	50.16	*
#7	97.60	75.64	81.62	64.86	44.69	71.38	55.76	49.60
#1	*	*	*	*	*	*	*	*
#11	*	*	*	*	*	60.72	40.28	*
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	90.10	65.88	56.61	32.17	37.94	56.20	50.98	31.75
STD. DEV.	62.64	41.56	46.62	34.13	31.92	42.57	27.39	32.52
%REL. STD. DEV.	69.52	63.10	82.35	106.12	84.14	75.74	53.72	102.40

TABLE D-3.4 Continued...

DAY #	59	63	66	70	73	78	80	84
POS #	SEP 20	SEP 24	SEP 27	OCT 1	OCT 4	OCT 9	OCT 11	OCT 15
	------------------------------mL------------------------------							
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#5	79.20	91.45	34.30	*	61.36	57.96	39.78	59.04
#8	78.00	67.50	28.52	34.72	52.00	37.80	41.76	57.78
#3	*	*	*	*	*	*	*	*
#7	58.96	62.92	*	49.50	47.58	52.80	*	56.55
#1	51.80	54.02	*	*	*	*	*	*
#11	40.80	33.44	*	*	*	34.04	*	*
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	51.46	51.56	10.47	14.04	26.82	30.43	13.59	28.90
STD. DEV.	26.75	28.77	14.90	20.30	27.13	23.01	19.23	28.90
%REL. STD. DEV.	51.97	55.81	142.32	144.65	101.14	75.62	141.48	100.03

DAY #	87	91	95	98	101	105	108	113
POS #	OCT 18	OCT 22	OCT 26	OCT 29	NOV 1	NOV 5	NOV 8	NOV 13
	------------------------------mL------------------------------							
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#5	*	*	-	-	-	-	-	-
#8	*	*	-	-	-	-	-	-
#3	*	*	*	*	*	*	*	*
#7	*	*	*	*	64.40	*	*	*
#1	*	*	*	*	*	*	*	*
#11	*	*	*	*	*	*	*	*
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00	16.10	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	0.00	27.89	0.00	0.00	0.00
%REL. STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TABLE D-3.4 Continued...

DAY #	116	119	123	126	129	133	136	140
POS #	NOV 16	NOV 19	NOV 23	NOV 26	NOV 29	DEC 3	DEC 6	DEC 10
	mL							
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#5	-	-	-	-	-	-	-	-
#8	-	-	-	-	-	-	-	-
#3	*	*	*	*	0.00	0.00	*	-
#7	*	*	*	*	*	*	*	-
#1	*	*	*	*	*	*	*	*
#11	*	*	*	*	48.60	*	*	*
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00	12.15	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	0.00	21.04	0.00	0.00	0.00
%REL. STD. DEV.	0.00	0.00	0.00	0.00	173.21	0.00	0.00	0.00

DAY #	143	147	150	154	158	161	165	168
POS #	DEC 13	DEC 17	DEC 20	DEC 24	DEC 28	DEC 31	JAN 4	JAN 7
	mL							
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#5	-	-	-	-	-	-	-	-
#8	-	-	-	-	-	-	-	-
#3	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#1	*	*	*	*	*	*	*	*
#11	*	*	*	*	*	*	*	*
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%REL. STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TABLE D-3.4 Continued...

DAY #	171	175	178	183
POS #	JAN 10	JAN 14	JAN 17	JAN 22
	...............mL...............			
#6	-	-	-	-
#10	-	-	-	-
#5	-	-	-	-
#8	-	-	-	-
#3	-	-	-	-
#7	-	-	-	-
#1	*	*	*	*
#11	*	*	*	*
#2	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	0.00
%REL. STD. DEV.	0.00	0.00	0.00	0.00

TABLE D-3.5 Amounts (ug) of TNT residues in aqueous leachates collected from MAAP soil columns.

DAY #	3	7	10	14	17	21	24	28
POS #	JUL 26	JUL 30	AUG 2	AUG 6	AUG 9	AUG 13	AUG 16	AUG 20
	ug							
#6	0.00	*	6.48	*	*	0.00	*	*
#10	28.35	11.56	14.64	*	*	*	*	*
#5	18.24	11.52	*	*	*	0.00	*	*
#8	16.38	*	*	0.00	*	0.00	0.00	*
#3	12.06	7.37	*	*	*	*	*	*
#7	21.56	7.92	*	0.00	*	*	0.00	*
#1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	*
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	12.07	4.80	2.64	0.00	0.00	0.00	0.00	0.00
STD. DEV.	10.30	4.99	5.01	0.00	0.00	0.00	0.00	0.00
%REL. STD. DEV.	85.31	104.08	189.66	0.00	0.00	0.00	0.00	0.00

DAY #	31	35	38	43	45	49	52	56
POS #	AUG 23	AUG 27	AUG 30	SEP 4	SEP 6	SEP 10	SEP 13	SEP 17
	ug							
#6	*	*	*	0.00	*	-	-	-
#10	*	*	0.00	*	*	-	-	-
#5	0.00	0.00	0.00	0.00	*	*	*	*
#8	0.00	*	0.00	0.00	*	*	*	*
#3	*	*	0.00	0.00	*	*	0.00	*
#7	*	*	0.00	0.00	*	*	*	*
#1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%REL. STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TABLE D-3.5 Continued...

DAY #	59	63	66	70	73	78	80	84
POS #	SEP 20	SEP 24	SEP 27	OCT 1	OCT 4	OCT 9	OCT 11	OCT 15
	ug							
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#5	*	*	*	*	*	*	0.00	0.00
#8	*	*	*	*	*	*	0.00	0.00
#3	*	0.00	*	0.00	*	*	0.00	0.00
#7	*	0.00	*	*	0.00	0.00	0.00	0.00
#1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%REL. STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DAY #	87	91	95	98	101	105	108	113
POS #	OCT 18	OCT 22	OCT 26	OCT 29	NOV 1	NOV 5	NOV 8	NOV 13
	ug							
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#5	0.00	0.00	-	-	-	-	-	-
#8	0.00	0.00	-	-	-	-	-	-
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%REL. STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TABLE D-3.5 Continued...

DAY #	116	119	123	126	129	133	136	140
POS #	NOV 16	NOV 19	NOV 23	NOV 26	NOV 29	DEC 3	DEC 6	DEC 10
	ug							
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#5	-	-	-	-	-	-	-	-
#8	-	-	-	-	-	-	-	-
#3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
#7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
#1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%REL. STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DAY #	143	147	150	154	158	161	165	168
POS #	DEC 13	DEC 17	DEC 20	DEC 24	DEC 28	DEC 31	JAN 4	JAN 7
	ug							
#6	-	-	-	-	-	-	-	-
#10	-	-	-	-	-	-	-	-
#5	-	-	-	-	-	-	-	-
#8	-	-	-	-	-	-	-	-
#3	-	-	-	-	-	-	-	-
#7	-	-	-	-	-	-	-	-
#1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
%REL. STD. DEV.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TABLE D-3.5 Continued...

DAY #	171	175	178	183
POS #	JAN 10	JAN 14	JAN 17	JAN 22
	-----------------	ug	-----------------	
#6	-	-	-	-
#10	-	-	-	-
#5	-	-	-	-
#8	-	-	-	-
#3	-	-	-	-
#7	-	-	-	-
#1	0.00	0.00	0.00	0.00
#11	0.00	0.00	0.00	0.00
#2	0.00	0.00	0.00	0.00
#4	0.00	0.00	0.00	0.00
#12	0.00	0.00	0.00	0.00
AVG.	0.00	0.00	0.00	0.00
STD. DEV.	0.00	0.00	0.00	0.00
%REL. STD. DEV.	0.00	0.00	0.00	0.00

TABLE D-4.1. Concentrations (mg/kg) of munition residues in soil sections (triplicates) from MAAP soil columns, after 0 weeks of leaching (time zero).

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
	COLUMN #s 1,3,5,6,7,8,10,11, (Treatment columns)				
		mg/kg			
1	AVG.	1019.37	1262.51	636.36	251.90
	STD. DEV.	81.32	81.87	46.97	20.46
	%REL. STD. DEV.	7.98	6.48	7.38	8.12
	Below this depth: no detectable concentrations of munition residues.				
	COLUMN #s 2,4,12 (Control columns)				
1	AVG.	0.00	0.00	0.00	0.00
	STD. DEV.	0.00	0.00	0.00	0.00
	%REL. STD. DEV.	0.00	0.00	0.00	0.00
	At all depths: no detectable concentrations of munition residues.				

TABLE D-4.2 Concentrations (mg/kg) of munition residues in soil sections (triplicates) from MAAP soil columns, after 6.5 weeks of leaching.

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #6		-------------------	mg/kg	-------------------	
1	AVG.	815.52	217.60	154.19	29.94
	STD. DEV.	11.96	3.68	2.89	1.27
	%REL. STD. DEV.	1.47	1.69	1.88	4.23
2	AVG.	35.90	38.86	18.13	4.17
	STD. DEV.	0.76	0.64	1.84	0.43
	%REL. STD. DEV.	2.12	1.65	10.14	10.20
3	AVG.	2.20	16.00	2.33	0.00
	STD. DEV.	0.19	0.31	0.57	0.00
	%REL. STD. DEV.	8.45	1.94	24.42	0.00
4	AVG.	2.01	14.14	2.30	0.00
	STD. DEV.	0.16	0.14	0.04	0.00
	%REL. STD. DEV.	7.75	0.99	1.85	0.00
5	AVG.	<1.4	11.15	<1.70	0.00
	STD. DEV.	-	0.57	-	0.00
	%REL. STD. DEV.	-	5.14	-	0.00
6	AVG.	<1.4	8.69	<1.70	0.00
	STD. DEV.	-	0.40	-	0.00
	%REL. STD. DEV.	-	4.64	-	0.00
7	AVG.	<1.4	8.78	0.00	0.00
	STD. DEV.	-	0.21	0.00	0.00
	%REL. STD. DEV.	-	2.38	0.00	0.00
8	AVG.	0.00	7.00	0.00	0.00
	STD. DEV.	0.00	1.12	0.00	0.00
	%REL. STD. DEV.	0.00	16.05	0.00	0.00
9	AVG.	<1.4	6.12	0.00	0.00
	STD. DEV.	-	0.53	0.00	0.00
	%REL. STD. DEV.	-	8.72	0.00	0.00
10	AVG.	<1.4	4.72	0.00	0.00
	STD. DEV.	-	0.38	0.00	0.00
	%REL. STD. DEV.	-	8.00	0.00	0.00

TABLE D-4.2 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #6		mg/kg			
11	AVG.	0.00	3.44	0.00	0.00
	STD. DEV.	0.00	0.27	0.00	0.00
	%REL. STD. DEV.	0.00	7.94	0.00	0.00
12	AVG.	0.00	3.06	0.00	0.00
	STD. DEV.	0.00	0.89	0.00	0.00
	%REL. STD. DEV.	0.00	29.14	0.00	0.00
13	AVG.	0.00	2.18	0.00	0.00
	STD. DEV.	0.00	0.49	0.00	0.00
	%REL. STD. DEV.	0.00	22.59	0.00	0.00
14	AVG.	0.00	1.98	0.00	0.00
	STD. DEV.	0.00	0.53	0.00	0.00
	%REL. STD. DEV.	0.00	26.66	0.00	0.00
15	AVG.	0.00	2.06	0.00	0.00
	STD. DEV.	0.00	0.32	0.00	0.00
	%REL. STD. DEV.	0.00	15.64	0.00	0.00
16	AVG.	0.00	1.72	0.00	0.00
	STD. DEV.	0.00	0.26	0.00	0.00
	%REL. STD. DEV.	0.00	15.02	0.00	0.00
17	AVG.	0.00	1.66	0.00	0.00
	STD. DEV.	0.00	0.18	0.00	0.00
	%REL. STD. DEV.	0.00	10.96	0.00	0.00
18	AVG.	0.00	1.36	0.00	0.00
	STD. DEV.	0.00	0.13	0.00	0.00
	%REL. STD. DEV.	0.00	9.24	0.00	0.00
19	AVG.	0.00	1.72	0.00	0.00
	STD. DEV.	0.00	0.27	0.00	0.00
	%REL. STD. DEV.	0.00	15.78	0.00	0.00
20	AVG.	0.00	2.83	0.00	0.00
	STD. DEV.	0.00	0.24	0.00	0.00
	%REL. STD. DEV.	0.00	8.47	0.00	0.00

TABLE D-4.2 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #6		-------------------mg/kg	----------------------------		
21	AVG.	0.00	3.07	0.00	0.00
	STD. DEV.	0.00	1.01	0.00	0.00
	%REL. STD. DEV.	0.00	32.81	0.00	0.00
22	AVG.	0.00	3.74	0.00	0.00
	STD. DEV.	0.00	0.13	0.00	0.00
	%REL. STD. DEV.	0.00	3.41	0.00	0.00
23	AVG.	0.00	3.00	0.00	0.00
	STD. DEV.	0.00	0.20	0.00	0.00
	%REL. STD. DEV.	0.00	6.66	0.00	0.00
24	AVG.	0.00	3.72	0.00	0.00
	STD. DEV.	0.00	0.88	0.00	0.00
	%REL. STD. DEV.	0.00	23.70	0.00	0.00
25	AVG.	0.00	3.22	0.00	0.00
	STD. DEV.	0.00	0.53	0.00	0.00
	%REL. STD. DEV.	0.00	16.61	0.00	0.00
26	AVG.	0.00	3.74	<1.70	0.00
	STD. DEV.	0.00	0.06	-	0.00
	%REL. STD. DEV.	0.00	1.50	-	0.00
27	AVG	0.00	5.59	<1.70	0.00
	STD	0.00	0.28	-	0.00
	%REL. STD. DEV.	0.00	5.09	-	0.00
COLUMN #10					
1	AVG.	604.01	180.72	123.87	24.08
	STD. DEV.	6.86	4.98	2.54	0.62
	%REL. STD. DEV.	1.13	2.75	2.05	2.58
2	AVG.	9.58	17.85	5.07	<3.70
	STD. DEV.	4.44	1.06	0.31	-
	%REL. STD. DEV.	46.34	5.94	6.16	-
3	AVG.	<1.4	11.56	<1.70	0.00
	STD. DEV.	-	0.03	-	0.00
	%REL. STD. DEV.	-	0.22	-	0.00

TABLE D-4.2 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #10		mg/kg			
4	AVG.	4.65	11.29	2.37	0.00
	STD. DEV.	0.12	0.15	0.46	0.00
	%REL. STD. DEV.	2.62	1.31	19.54	0.00
5	AVG.	1.74	9.59	<1.70	0.00
	STD. DEV.	0.10	0.08	-	0.00
	%REL. STD. DEV.	5.73	0.81	-	0.00
6	AVG.	<1.4	8.12	<1.70	0.00
	STD. DEV.	-	0.07	-	0.00
	%REL. STD. DEV.	-	0.86	-	0.00
7	AVG.	<1.4	8.58	0.00	0.00
	STD. DEV.	-	0.50	0.00	0.00
	%REL. STD. DEV.	-	5.83	0.00	0.00
8	AVG.	<1.4	6.56	0.00	0.00
	STD. DEV.	-	0.34	0.00	0.00
	%REL. STD. DEV.	-	5.16	0.00	0.00
9	AVG.	<1.4	5.91	0.00	0.00
	STD. DEV.	-	0.38	0.00	0.00
	%REL. STD. DEV.	-	6.46	0.00	0.00
10	AVG.	<1.4	4.77	0.00	0.00
	STD. DEV.	-	0.22	0.00	0.00
	%REL. STD. DEV.	-	4.59	0.00	0.00
11	AVG.	0.00	3.58	0.00	0.00
	STD. DEV.	0.00	0.12	0.00	0.00
	%REL. STD. DEV.	0.00	3.34	0.00	0.00
12	AVG.	<1.4	4.16	0.00	0.00
	STD. DEV.	-	0.08	0.00	0.00
	%REL. STD. DEV.	-	1.90	0.00	0.00
13	AVG.	0.00	4.27	0.00	0.00
	STD. DEV.	0.00	1.02	0.00	0.00
	%REL. STD. DEV.	0.00	24.01	0.00	0.00

TABLE D-4.2 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #10		mg/kg			
14	AVG.	0.00	4.54	0.00	0.00
	STD. DEV.	0.00	0.51	0.00	0.00
	%REL. STD. DEV.	0.00	11.24	0.00	0.00
15	AVG.	0.00	2.75	0.00	0.00
	STD. DEV.	0.00	0.02	0.00	0.00
	%REL. STD. DEV.	0.00	0.72	0.00	0.00
16	AVG.	<1.4	3.90	0.00	0.00
	STD. DEV.	-	0.20	0.00	0.00
	%REL. STD. DEV.	-	5.17	0.00	0.00
17	AVG.	0.00	3.75	0.00	0.00
	STD. DEV.	0.00	0.48	0.00	0.00
	%REL. STD. DEV.	0.00	12.85	0.00	0.00
18	AVG.	0.00	2.85	0.00	0.00
	STD. DEV.	0.00	0.45	0.00	0.00
	%REL. STD. DEV.	0.00	15.63	0.00	0.00
19	AVG.	0.00	3.99	0.00	0.00
	STD. DEV.	0.00	0.13	0.00	0.00
	%REL. STD. DEV.	0.00	3.30	0.00	0.00
20	AVG.	0.00	4.22	0.00	0.00
	STD. DEV.	0.00	1.00	0.00	0.00
	%REL. STD. DEV.	0.00	23.57	0.00	0.00
21	AVG.	0.00	2.56	0.00	0.00
	STD. DEV.	0.00	0.31	0.00	0.00
	%REL. STD. DEV.	0.00	12.03	0.00	0.00
22	AVG.	0.00	3.09	0.00	0.00
	STD. DEV.	0.00	0.43	0.00	0.00
	%REL. STD. DEV.	0.00	13.88	0.00	0.00
23	AVG.	0.00	2.87	0.00	0.00
	STD. DEV.	0.00	0.42	0.00	0.00
	%REL. STD. DEV.	0.00	14.54	0.00	0.00

TABLE D-4.2 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #10		----------	mg/kg	----------	
24	AVG.	0.00	2.28	0.00	0.00
	STD. DEV.	0.00	0.24	0.00	0.00
	%REL. STD. DEV.	0.00	10.58	0.00	0.00
25	AVG.	0.00	2.59	0.00	0.00
	STD. DEV.	0.00	0.58	0.00	0.00
	%REL. STD. DEV.	0.00	22.49	0.00	0.00
26	AVG.	0.00	2.08	0.00	0.00
	STD. DEV.	0.00	0.39	0.00	0.00
	%REL. STD. DEV.	0.00	18.66	0.00	0.00
27	AVG.	0.00	2.87	0.00	0.00
	STD. DEV.	0.00	1.17	0.00	0.00
	%REL. STD. DEV.	0.00	40.65	0.00	0.00

TABLE D-4.3 Concentrations (mg/kg) of munition residues in soil sections (triplicates) from MAAP soil columns, after 13 weeks of leaching.

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #5		--------mg/kg--------			
1	AVG.	638.43	52.13	129.41	24.32
	STD. DEV.	7.92	0.34	8.15	2.20
	%REL. STD. DEV.	1.24	0.66	6.30	9.06
2	AVG.	9.05	10.06	5.37	0.00
	STD. DEV.	0.14	0.22	0.27	0.00
	%REL. STD. DEV.	1.54	2.15	5.05	0.00
3	AVG.	4.43	11.02	2.86	0.00
	STD. DEV.	0.23	0.09	0.03	0.00
	%REL. STD. DEV.	5.15	0.86	1.06	0.00
4	AVG.	2.85	12.34	1.80	0.00
	STD. DEV.	0.11	0.32	0.16	0.00
	%REL. STD. DEV.	4.02	2.56	8.87	0.00
5	AVG.	2.06	13.16	<1.70	0.00
	STD. DEV.	0.12	0.46	-	0.00
	%REL. STD. DEV.	5.89	3.48	-	0.00
6	AVG.	<1.4	12.89	<1.70	0.00
	STD. DEV.	-	0.38	-	0.00
	%REL. STD. DEV.	-	2.94	-	0.00
7	AVG.	<1.4	14.66	0.00	0.00
	STD. DEV.	-	0.52	0.00	0.00
	%REL. STD. DEV.	-	3.56	0.00	0.00
8	AVG.	<1.4	14.24	0.00	0.00
	STD. DEV.	-	0.48	0.00	0.00
	%REL. STD. DEV.	-	3.35	0.00	0.00
9	AVG.	<1.4	13.02	0.00	0.00
	STD. DEV.	-	0.35	0.00	0.00
	%REL. STD. DEV.	-	2.66	0.00	0.00
10	AVG.	<1.4	9.87	0.00	0.00
	STD. DEV.	-	0.51	0.00	0.00
	%REL. STD. DEV.	-	5.20	0.00	0.00
11	AVG.	<1.4	7.07	0.00	0.00
	STD. DEV.	-	0.16	0.00	0.00
	%REL. STD. DEV.	-	2.32	0.00	0.00

TABLE D-4.3 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #5		mg/kg			
12	AVG.	0.00	6.17	0.00	0.00
	STD. DEV.	0.00	0.95	0.00	0.00
	%REL. STD. DEV.	0.00	15.35	0.00	0.00
13	AVG.	0.00	5.71	0.00	0.00
	STD. DEV.	0.00	0.28	0.00	0.00
	%REL. STD. DEV.	0.00	4.94	0.00	0.00
14	AVG.	0.00	5.36	0.00	0.00
	STD. DEV.	0.00	0.55	0.00	0.00
	%REL. STD. DEV.	0.00	10.29	0.00	0.00
15	AVG.	0.00	4.67	0.00	0.00
	STD. DEV.	0.00	0.10	0.00	0.00
	%REL. STD. DEV.	0.00	2.14	0.00	0.00
16	AVG.	0.00	5.80	0.00	0.00
	STD. DEV.	0.00	0.20	0.00	0.00
	%REL. STD. DEV.	0.00	3.43	0.00	0.00
17	AVG.	0.00	5.33	0.00	0.00
	STD. DEV.	0.00	0.24	0.00	0.00
	%REL. STD. DEV.	0.00	4.59	0.00	0.00
18	AVG.	0.00	4.45	0.00	0.00
	STD. DEV.	0.00	0.26	0.00	0.00
	%REL. STD. DEV.	0.00	5.85	0.00	0.00
19	AVG.	0.00	4.43	0.00	0.00
	STD. DEV.	0.00	0.28	0.00	0.00
	%REL. STD. DEV.	0.00	6.37	0.00	0.00
20	AVG.	0.00	4.39	0.00	0.00
	STD. DEV.	0.00	0.10	0.00	0.00
	%REL. STD. DEV.	0.00	2.31	0.00	0.00
21	AVG.	0.00	3.74	0.00	0.00
	STD. DEV.	0.00	0.62	0.00	0.00
	%REL. STD. DEV.	0.00	16.52	0.00	0.00
22	AVG.	0.00	3.34	0.00	0.00
	STD. DEV.	0.00	0.32	0.00	0.00
	%REL. STD. DEV.	0.00	9.64	0.00	0.00
23	AVG.	0.00	2.97	0.00	0.00
	STD. DEV.	0.00	0.76	0.00	0.00
	%REL. STD. DEV.	0.00	25.49	0.00	0.00

TABLE D-4.3 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #5		---------mg/kg---------			
24	AVG.	0.00	3.73	0.00	0.00
	STD. DEV.	0.00	0.66	0.00	0.00
	%REL. STD. DEV.	0.00	17.63	0.00	0.00
25	AVG.	0.00	3.67	0.00	0.00
	STD. DEV.	0.00	0.74	0.00	0.00
	%REL. STD. DEV.	0.00	20.06	0.00	0.00
26	AVG.	0.00	2.88	0.00	0.00
	STD. DEV.	0.00	0.18	0.00	0.00
	%REL. STD. DEV.	0.00	6.29	0.00	0.00
27	AVG.	0.00	4.39	0.00	0.00
	STD. DEV.	0.00	0.42	0.00	0.00
	%REL. STD. DEV.	0.00	9.53	0.00	0.00
COLUMN #8					
1	AVG.	565.20	113.42	138.28	24.21
	STD. DEV.	10.63	3.37	6.21	1.79
	%REL. STD. DEV.	1.88	2.97	4.49	7.38
2	AVG.	12.38	15.96	6.95	<3.70
	STD. DEV.	0.12	0.44	0.20	-
	%REL. STD. DEV.	0.96	2.74	2.95	-
3	AVG.	5.63	12.23	3.71	0.00
	STD. DEV.	0.11	0.08	0.06	0.00
	%REL. STD. DEV.	2.04	0.67	1.71	0.00
4	AVG.	3.74	12.92	2.26	0.00
	STD. DEV.	0.06	0.53	0.54	0.00
	%REL. STD. DEV.	1.61	4.10	23.86	0.00
5	AVG.	2.06	13.16	<1.70	0.00
	STD. DEV.	0.12	0.46	-	0.00
	%REL. STD. DEV.	5.89	3.48	-	0.00
6	AVG.	<1.4	13.16	<1.70	0.00
	STD. DEV.	-	0.60	-	0.00
	%REL. STD. DEV.	-	4.57	-	0.00
7	AVG.	<1.4	14.23	<1.70	0.00
	STD. DEV.	-	0.22	-	0.00
	%REL. STD. DEV.	-	1.58	-	0.00

TABLE D-4.3 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #8		mg/kg			
8	AVG.	<1.4	13.86	<1.70	0.00
	STD. DEV.	-	0.36	-	0.00
	%REL. STD. DEV.	-	2.63	-	0.00
9	AVG.	0.00	12.15	0.00	0.00
	STD. DEV.	0.00	0.48	0.00	0.00
	%REL. STD. DEV.	0.00	3.96	0.00	0.00
10	AVG.	0.00	11.38	0.00	0.00
	STD. DEV.	0.00	0.64	0.00	0.00
	%REL. STD. DEV.	0.00	5.60	0.00	0.00
11	AVG.	0.00	9.66	0.00	0.00
	STD. DEV.	0.00	0.45	0.00	0.00
	%REL. STD. DEV.	0.00	4.67	0.00	0.00
12	AVG.	0.00	8.28	0.00	0.00
	STD. DEV.	0.00	0.22	0.00	0.00
	%REL. STD. DEV.	0.00	2.62	0.00	0.00
13	AVG.	0.00	4.30	0.00	0.00
	STD. DEV.	0.00	0.44	0.00	0.00
	%REL. STD. DEV.	0.00	10.35	0.00	0.00
14	AVG.	0.00	5.18	0.00	0.00
	STD. DEV.	0.00	0.36	0.00	0.00
	%REL. STD. DEV.	0.00	6.91	0.00	0.00
15	AVG.	0.00	5.45	0.00	0.00
	STD. DEV.	0.00	0.16	0.00	0.00
	%REL. STD. DEV.	0.00	2.85	0.00	0.00
16	AVG.	<1.4	5.61	0.00	0.00
	STD. DEV.	-	0.55	0.00	0.00
	%REL. STD. DEV.	-	9.73	0.00	0.00
17	AVG.	0.00	5.77	0.00	0.00
	STD. DEV.	0.00	0.33	0.00	0.00
	%REL. STD. DEV.	0.00	5.64	0.00	0.00
18	AVG.	0.00	5.89	0.00	0.00
	STD. DEV.	0.00	0.25	0.00	0.00
	%REL. STD. DEV.	0.00	4.24	0.00	0.00
19	AVG.	0.00	5.72	0.00	0.00
	STD. DEV.	0.00	0.17	0.00	0.00
	%REL. STD. DEV.	0.00	2.93	0.00	0.00

TABLE D-4.3 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #8		-----------------	mg/kg	-----------------	-----------------
20	AVG.	0.00	5.78	0.00	0.00
	STD. DEV.	0.00	0.21	0.00	0.00
	%REL. STD. DEV.	0.00	3.68	0.00	0.00
21	AVG.	0.00	5.91	0.00	0.00
	STD. DEV.	0.00	0.14	0.00	0.00
	%REL. STD. DEV.	0.00	2.39	0.00	0.00
22	AVG.	0.00	5.66	0.00	0.00
	STD. DEV.	0.00	0.17	0.00	0.00
	%REL. STD. DEV.	0.00	2.97	0.00	0.00
23	AVG.	0.00	5.56	0.00	0.00
	STD. DEV.	0.00	0.43	0.00	0.00
	%REL. STD. DEV.	0.00	7.70	0.00	0.00
24	AVG.	0.00	5.13	0.00	0.00
	STD. DEV.	0.00	0.37	0.00	0.00
	%REL. STD. DEV.	0.00	7.15	0.00	0.00
25	AVG.	0.00	5.26	0.00	0.00
	STD. DEV.	0.00	0.44	0.00	0.00
	%REL. STD. DEV.	0.00	8.40	0.00	0.00
26	AVG.	0.00	5.09	0.00	0.00
	STD. DEV.	0.00	0.71	0.00	0.00
	%REL. STD. DEV.	0.00	13.95	0.00	0.00
27	AVG.	0.00	10.09	0.00	0.00
	STD. DEV.	0.00	1.54	0.00	0.00
	%REL. STD. DEV.	0.00	15.30	0.00	0.00

TABLE D-4.4 Concentrations (mg/kg) of munition residues in soil sections (triplicates) from MAAP soil columns, after 19.5 weeks of leaching.

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #3		----------	mg/kg	----------	
1	AVG.	559.30	55.01	124.39	21.56
	STD. DEV.	11.69	1.69	2.25	0.59
	%REL. STD. DEV.	2.09	3.07	1.81	2.72
2	AVG.	12.46	14.50	6.79	<3.70
	STD. DEV.	0.32	0.27	0.62	-
	%REL. STD. DEV.	2.56	1.88	9.18	-
3	AVG.	7.81	12.29	4.39	0.00
	STD. DEV.	0.23	0.55	0.19	0.00
	%REL. STD. DEV.	2.96	4.50	4.24	0.00
4	AVG.	4.44	11.65	2.58	0.00
	STD. DEV.	0.07	0.29	0.76	0.00
	%REL. STD. DEV.	1.49	2.49	29.36	0.00
5	AVG.	2.70	11.46	0.00	0.00
	STD. DEV.	0.05	0.22	0.00	0.00
	%REL. STD. DEV.	1.70	1.92	0.00	0.00
6	AVG.	1.51	12.20	0.00	0.00
	STD. DEV.	0.08	0.28	0.00	0.00
	%REL. STD. DEV.	5.23	2.29	0.00	0.00
7	AVG.	<1.4	10.12	0.00	0.00
	STD. DEV.	-	0.61	0.00	0.00
	%REL. STD. DEV.	-	6.01	0.00	0.00
8	AVG.	<1.4	9.83	0.00	0.00
	STD. DEV.	-	0.52	0.00	0.00
	%REL. STD. DEV.	-	5.28	0.00	0.00
9	AVG.	<1.4	8.72	0.00	0.00
	STD. DEV.	-	0.52	0.00	0.00
	%REL. STD. DEV.	-	5.96	0.00	0.00
10	AVG.	<1.4	7.63	0.00	0.00
	STD. DEV.	-	0.38	0.00	0.00
	%REL. STD. DEV.	-	5.03	0.00	0.00
11	AVG.	<1.4	4.63	0.00	0.00
	STD. DEV.	-	0.90	0.00	0.00
	%REL. STD. DEV.	-	19.53	0.00	0.00

TABLE D-4.4 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #3		mg/kg			
12	AVG.	<1.4	4.22	0.00	0.00
	STD. DEV.	-	0.46	0.00	0.00
	%REL. STD. DEV.	-	10.97	0.00	0.00
13	AVG.	<1.4	4.79	0.00	0.00
	STD. DEV.	-	0.67	0.00	0.00
	%REL. STD. DEV.	-	14.01	0.00	0.00
14	AVG.	<1.4	4.15	0.00	0.00
	STD. DEV.	-	0.72	0.00	0.00
	%REL. STD. DEV.	-	17.25	0.00	0.00
15	AVG.	<1.4	5.22	0.00	0.00
	STD. DEV.	-	0.72	0.00	0.00
	%REL. STD. DEV.	-	13.87	0.00	0.00
16	AVG.	0.00	5.58	0.00	0.00
	STD. DEV.	0.00	0.12	0.00	0.00
	%REL. STD. DEV.	0.00	2.22	0.00	0.00
17	AVG.	0.00	5.67	0.00	0.00
	STD. DEV.	0.00	0.11	0.00	0.00
	%REL. STD. DEV.	0.00	2.03	0.00	0.00
18	AVG.	0.00	5.74	0.00	0.00
	STD. DEV.	0.00	0.32	0.00	0.00
	%REL. STD. DEV.	0.00	5.53	0.00	0.00
19	AVG.	0.00	5.51	0.00	0.00
	STD. DEV.	0.00	0.61	0.00	0.00
	%REL. STD. DEV.	0.00	11.08	0.00	0.00
20	AVG.	0.00	5.16	0.00	0.00
	STD. DEV.	0.00	0.16	0.00	0.00
	%REL. STD. DEV.	0.00	3.10	0.00	0.00
21	AVG.	0.00	5.16	0.00	0.00
	STD. DEV.	0.00	0.39	0.00	0.00
	%REL. STD. DEV.	0.00	7.46	0.00	0.00
22	AVG.	0.00	4.53	0.00	0.00
	STD. DEV.	0.00	0.58	0.00	0.00
	%REL. STD. DEV.	0.00	12.87	0.00	0.00
23	AVG.	0.00	3.72	0.00	0.00
	STD. DEV.	0.00	0.85	0.00	0.00
	%REL. STD. DEV.	0.00	22.95	0.00	0.00

TABLE D-4.4 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #7			mg/kg		
9	AVG.	6.56	5.34	3.80	0.00
	STD. DEV.	0.11	0.52	0.40	0.00
	%REL. STD. DEV.	1.66	9.66	10.66	0.00
10	AVG.	2.51	5.24	0.00	0.00
	STD. DEV.	0.09	0.06	0.00	0.00
	%REL. STD. DEV.	3.40	1.10	0.00	0.00
11	AVG.	2.03	5.99	0.00	0.00
	STD. DEV.	0.08	0.19	0.00	0.00
	%REL. STD. DEV.	3.93	3.24	0.00	0.00
12	AVG.	1.72	5.32	0.00	0.00
	STD. DEV.	0.06	0.41	0.00	0.00
	%REL. STD. DEV.	3.24	7.75	0.00	0.00
13	AVG.	1.67	4.84	0.00	0.00
	STD. DEV.	0.13	0.83	0.00	0.00
	%REL. STD. DEV.	7.93	17.20	0.00	0.00
14	AVG.	1.53	4.50	0.00	0.00
	STD. DEV.	0.15	0.43	0.00	0.00
	%REL. STD. DEV.	9.76	9.62	0.00	0.00
15	AVG.	<1.4	4.06	0.00	0.00
	STD. DEV.	-	0.32	0.00	0.00
	%REL. STD. DEV.	-	7.99	0.00	0.00
16	AVG.	<1.4	4.49	0.00	0.00
	STD. DEV.	-	0.19	0.00	0.00
	%REL. STD. DEV.	-	4.29	0.00	0.00
17	AVG.	<1.4	4.49	0.00	0.00
	STD. DEV.	-	0.41	0.00	0.00
	%REL. STD. DEV.	-	9.11	0.00	0.00
18	AVG.	<1.4	4.04	0.00	0.00
	STD. DEV.	-	0.24	0.00	0.00
	%REL. STD. DEV.	-	5.82	0.00	0.00
19	AVG.	<1.4	3.40	<1.70	0.00
	STD. DEV.	-	0.32	-	0.00
	%REL. STD. DEV.	-	9.48	-	0.00
20	AVG.	<1.4	3.35	<1.70	0.00
	STD. DEV.	-	0.44	-	0.00
	%REL. STD. DEV.	-	13.25	-	0.00

TABLE D-4.4 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #3		mg/kg			
24	AVG.	0.00	3.54	0.00	0.00
	STD. DEV.	0.00	0.33	0.00	0.00
	%REL. STD. DEV.	0.00	9.31	0.00	0.00
25	AVG.	0.00	2.91	0.00	0.00
	STD. DEV.	0.00	0.12	0.00	0.00
	%REL. STD. DEV.	0.00	4.17	0.00	0.00
26	AVG.	0.00	5.18	0.00	0.00
	STD. DEV.	0.00	0.26	0.00	0.00
	%REL. STD. DEV.	0.00	5.00	0.00	0.00
COLUMN #7					
1	AVG.	451.48	41.55	105.00	17.98
	STD. DEV.	3.53	0.80	1.94	0.50
	%REL. STD. DEV.	0.78	1.92	1.85	2.81
2	AVG.	60.61	16.03	18.31	<3.70
	STD. DEV.	0.69	0.13	1.44	-
	%REL. STD. DEV.	1.14	0.84	7.84	-
3	AVG.	26.14	8.51	6.00	0.00
	STD. DEV.	0.45	1.32	0.08	0.00
	%REL. STD. DEV.	1.73	15.54	1.39	0.00
4	AVG.	18.84	8.68	5.29	<3.70
	STD. DEV.	0.32	0.21	1.05	-
	%REL. STD. DEV.	1.68	2.41	19.91	-
5	AVG.	12.97	7.14	3.99	0.00
	STD. DEV.	0.21	0.13	0.21	0.00
	%REL. STD. DEV.	1.60	1.89	5.16	0.00
6	AVG.	13.89	8.06	3.90	0.00
	STD. DEV.	0.38	0.27	0.54	0.00
	%REL. STD. DEV.	2.72	3.30	13.93	0.00
7	AVG.	20.56	4.23	5.13	<3.70
	STD. DEV.	0.24	0.23	0.20	-
	%REL. STD. DEV.	1.16	5.38	3.95	-
8	AVG.	14.09	4.78	4.14	0.00
	STD. DEV.	0.36	0.31	0.39	0.00
	%REL. STD. DEV.	2.54	6.43	9.32	0.00

TABLE D-4.4 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #7		--------------------mg/kg--------------------			
21	AVG.	<1.4	4.11	<1.70	0.00
	STD. DEV.	-	0.21	-	0.00
	%REL. STD. DEV.	-	5.20	-	0.00
22	AVG.	<1.4	4.07	0.00	0.00
	STD. DEV.	-	0.17	0.00	0.00
	%REL. STD. DEV.	-	4.06	0.00	0.00
23	AVG.	<1.4	4.56	0.00	0.00
	STD. DEV.	-	0.06	0.00	0.00
	%REL. STD. DEV.	-	1.31	0.00	0.00
24	AVG.	<1.4	5.08	0.00	0.00
	STD. DEV.	-	0.11	0.00	0.00
	%REL. STD. DEV.	-	2.22	0.00	0.00
25	AVG.	<1.4	5.04	<1.70	0.00
	STD. DEV.	-	0.14	-	0.00
	%REL. STD. DEV.	-	2.82	-	0.00
26	AVG.	<1.4	5.26	0.00	0.00
	STD. DEV.	-	0.07	0.00	0.00
	%REL. STD. DEV.	-	1.29	0.00	0.00
27	AVG.	<1.4	4.63	0.00	0.00
	STD. DEV.	-	0.43	0.00	0.00
	%REL. STD. DEV.	-	9.29	0.00	0.00

TABLE D-4.5 Concentrations (mg/kg) of munition residues in soil sections (triplicates) from MAAP soil columns, after 26 weeks of leaching.

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #1		mg/kg			
1	AVG.	475.80	22.42	101.99	18.19
	STD. DEV.	7.55	0.64	4.86	0.86
	%REL. STD. DEV.	1.59	2.85	4.76	4.75
2	AVG.	9.35	4.77	3.38	0.00
	STD. DEV.	0.19	1.04	0.06	0.00
	%REL. STD. DEV.	2.02	21.82	1.85	0.00
3	AVG.	5.90	17.39	2.83	0.00
	STD. DEV.	0.11	8.02	0.54	0.00
	%REL. STD. DEV.	1.79	46.13	19.21	0.00
4	AVG.	4.54	21.06	<1.70	0.00
	STD. DEV.	0.01	6.23	-	0.00
	%REL. STD. DEV.	0.27	29.59	-	0.00
5	AVG.	4.11	13.61	0.00	0.00
	STD. DEV.	0.07	4.10	0.00	0.00
	%REL. STD. DEV.	1.73	30.15	0.00	0.00
6	AVG.	3.56	7.30	1.97	0.00
	STD. DEV.	0.05	3.30	0.58	0.00
	%REL. STD. DEV.	1.36	45.18	29.38	0.00
7	AVG.	3.26	3.17	0.00	0.00
	STD. DEV.	0.24	0.57	0.00	0.00
	%REL. STD. DEV.	7.51	17.91	0.00	0.00
8	AVG.	3.23	3.54	0.00	0.00
	STD. DEV.	0.05	0.21	0.00	0.00
	%REL. STD. DEV.	1.52	5.79	0.00	0.00
9	AVG.	2.65	3.37	0.00	0.00
	STD. DEV.	0.03	0.20	0.00	0.00
	%REL. STD. DEV.	1.23	6.02	0.00	0.00
10	AVG.	2.16	3.91	0.00	0.00
	STD. DEV.	0.06	0.06	0.00	0.00
	%REL. STD. DEV.	2.65	1.58	0.00	0.00
11	AVG.	2.07	4.13	0.00	0.00
	STD. DEV.	0.14	0.20	0.00	0.00
	%REL. STD. DEV.	6.60	4.90	0.00	0.00

TABLE D-4.5 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #1		---------mg/kg---------			
12	AVG.	1.79	3.47	0.00	0.00
	STD. DEV.	0.08	0.35	0.00	0.00
	%REL. STD. DEV.	4.44	10.21	0.00	0.00
13	AVG.	1.53	4.51	0.00	0.00
	STD. DEV.	0.06	0.31	0.00	0.00
	%REL. STD. DEV.	4.23	6.85	0.00	0.00
14	AVG.	1.61	5.14	0.00	0.00
	STD. DEV.	0.38	1.05	0.00	0.00
	%REL. STD. DEV.	23.60	20.41	0.00	0.00
15	AVG.	<1.4	5.58	0.00	0.00
	STD. DEV.	-	0.15	0.00	0.00
	%REL. STD. DEV.	-	2.63	0.00	0.00
16	AVG.	<1.4	5.80	0.00	0.00
	STD. DEV.	-	0.34	0.00	0.00
	%REL. STD. DEV.	-	5.82	0.00	0.00
17	AVG.	<1.4	5.70	0.00	0.00
	STD. DEV.	-	0.41	0.00	0.00
	%REL. STD. DEV.	-	7.27	0.00	0.00
18	AVG.	<1.4	5.40	0.00	0.00
	STD. DEV.	-	0.51	0.00	0.00
	%REL. STD. DEV.	-	9.52	0.00	0.00
19	AVG.	<1.4	4.70	0.00	0.00
	STD. DEV.	-	0.16	0.00	0.00
	%REL. STD. DEV.	-	3.48	0.00	0.00
20	AVG.	<1.4	5.15	0.00	0.00
	STD. DEV.	-	0.26	0.00	0.00
	%REL. STD. DEV.	-	5.11	0.00	0.00
21	AVG.	<1.4	4.97	0.00	0.00
	STD. DEV.	-	0.12	0.00	0.00
	%REL. STD. DEV.	-	2.37	0.00	0.00
22	AVG.	<1.4	4.96	0.00	0.00
	STD. DEV.	-	0.28	0.00	0.00
	%REL. STD. DEV.	-	5.55	0.00	0.00
23	AVG.	<1.4	4.20	0.00	0.00
	STD. DEV.	-	0.12	0.00	0.00
	%REL. STD. DEV.	-	2.93	0.00	0.00

TABLE D-4.5 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #1		----------mg/kg----------			
24	AVG.	<1.4	4.34	0.00	0.00
	STD. DEV.	-	0.26	0.00	0.00
	%REL. STD. DEV.	-	6.04	0.00	0.00
25	AVG.	<1.4	4.68	0.00	0.00
	STD. DEV.	-	0.09	0.00	0.00
	%REL. STD. DEV.	-	1.98	0.00	0.00
26	AVG.	<1.4	3.49	0.00	0.00
	STD. DEV.	-	0.14	0.00	0.00
	%REL. STD. DEV.	-	4.01	0.00	0.00
COLUMN #11					
1	AVG.	580.48	38.13	122.08	20.16
	STD. DEV.	6.57	10.14	4.73	1.06
	%REL. STD. DEV.	1.13	26.59	3.88	5.27
2	AVG.	20.28	8.39	7.87	<3.70
	STD. DEV.	0.39	0.55	0.13	-
	%REL. STD. DEV.	1.92	6.55	1.71	-
3	AVG.	11.78	11.32	5.24	<3.70
	STD. DEV.	0.20	2.13	0.04	-
	%REL. STD. DEV.	1.68	18.83	0.79	-
4	AVG.	10.45	7.33	5.74	<3.70
	STD. DEV.	0.25	0.98	0.03	-
	%REL. STD. DEV.	2.39	13.36	0.54	-
5	AVG.	6.39	4.87	3.50	0.00
	STD. DEV.	0.21	0.31	0.08	0.00
	%REL. STD. DEV.	3.22	6.29	2.23	0.00
6	AVG.	4.13	4.49	<1.70	0.00
	STD. DEV.	0.03	0.32	-	0.00
	%REL. STD. DEV.	0.77	7.16	-	0.00
7	AVG.	3.22	4.51	0.00	0.00
	STD. DEV.	0.22	1.06	0.00	0.00
	%REL. STD. DEV.	6.74	23.49	0.00	0.00
8	AVG.	2.44	4.69	0.00	0.00
	STD. DEV.	0.03	0.32	0.00	0.00
	%REL. STD. DEV.	1.18	6.88	0.00	0.00

TABLE D-4.5 Continued...

SAMPLE ID Depth (inches; 2.54-cm sections)		HMX	RDX	2,4-DNT	2,6-DNT
COLUMN #11		--------mg/kg--------			
9	AVG.	1.82	5.53	0.00	0.00
	STD. DEV.	0.11	0.17	0.00	0.00
	%REL. STD. DEV.	5.81	3.07	0.00	0.00
10	AVG.	1.44	5.51	0.00	0.00
	STD. DEV.	0.09	0.38	0.00	0.00
	%REL. STD. DEV.	6.00	6.88	0.00	0.00
11	AVG.	<1.4	5.73	0.00	0.00
	STD. DEV.	-	0.22	0.00	0.00
	%REL. STD. DEV.	-	3.84	0.00	0.00
12	AVG.	<1.4	5.64	0.00	0.00
	STD. DEV.	-	0.10	0.00	0.00
	%REL. STD. DEV.	-	1.71	0.00	0.00
13	AVG.	<1.4	5.11	0.00	0.00
	STD. DEV.	-	0.24	0.00	0.00
	%REL. STD. DEV.	-	4.64	0.00	0.00
14	AVG.	<1.4	3.54	0.00	0.00
	STD. DEV.	-	0.09	0.00	0.00
	%REL. STD. DEV.	-	2.65	0.00	0.00
15	AVG.	0.00	3.84	0.00	0.00
	STD. DEV.	0.00	0.21	0.00	0.00
	%REL. STD. DEV.	0.00	5.40	0.00	0.00
16	AVG.	0.00	7.07	0.00	0.00
	STD. DEV.	0.00	0.65	0.00	0.00
	%REL. STD. DEV.	0.00	9.26	0.00	0.00
17	AVG.	0.00	6.66	0.00	0.00
	STD. DEV.	0.00	2.32	0.00	0.00
	%REL. STD. DEV.	0.00	34.84	0.00	0.00
18	AVG.	0.00	4.20	0.00	0.00
	STD. DEV.	0.00	0.80	0.00	0.00
	%REL. STD. DEV.	0.00	19.16	0.00	0.00
19	AVG.	0.00	9.72	0.00	0.00
	STD. DEV.	0.00	0.26	0.00	0.00
	%REL. STD. DEV.	0.00	2.71	0.00	0.00
20	AVG.	0.00	8.25	0.00	0.00
	STD. DEV.	0.00	0.37	0.00	0.00
	%REL. STD. DEV.	0.00	4.47	0.00	0.00

TABLE D-4.5 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #11		-----------------	mg/kg	-----------------	
21	AVG.	0.00	4.54	0.00	0.00
	STD. DEV.	0.00	1.17	0.00	0.00
	%REL. STD. DEV.	0.00	25.68	0.00	0.00
22	AVG.	0.00	4.85	0.00	0.00
	STD. DEV.	0.00	1.09	0.00	0.00
	%REL. STD. DEV.	0.00	22.51	0.00	0.00
23	AVG.	0.00	3.28	0.00	0.00
	STD. DEV.	0.00	0.58	0.00	0.00
	%REL. STD. DEV.	0.00	17.60	0.00	0.00
24	AVG.	0.00	3.36	0.00	0.00
	STD. DEV.	0.00	0.33	0.00	0.00
	%REL. STD. DEV.	0.00	9.98	0.00	0.00
25	AVG.	0.00	4.05	0.00	0.00
	STD. DEV.	0.00	0.15	0.00	0.00
	%REL. STD. DEV.	0.00	3.60	0.00	0.00
26	AVG.	0.00	4.46	0.00	0.00
	STD. DEV.	0.00	0.23	0.00	0.00
	%REL. STD. DEV.	0.00	5.21	0.00	0.00
27	AVG.	0.00	3.19	0.00	0.00
	STD. DEV.	0.00	0.14	0.00	0.00
	%REL. STD. DEV.	0.00	4.28	0.00	0.00

TABLE D-4.6. Amounts (ug) of munition residues in each soil-core section (triplicates) from MAAP soil columns, after 0 weeks of leaching (time zero).

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
	COLUMN #s 1,3,5,6,7,8,10,11, (Treatment columns)				
		mg/kg			
1	AVG.	163099.20	202001.60	101817.60	40304.00
	STD. DEV.	13011.20	13099.20	7515.20	3273.60
	%REL. STD. DEV.	7.98	6.48	7.38	8.12
	Below this depth: no detectable concentrations of munition residues.				
	COLUMN #s 2,4,12 (Control columns)				
1	AVG.	0.00	0.00	0.00	0.00
	STD. DEV.	0.00	0.00	0.00	0.00
	%REL. STD. DEV.	0.00	0.00	0.00	0.00
	At all depths: no detectable concentrations of munition residues.				

TABLE D-4.7 Amounts (ug) of munition residues in each soil-core section (triplicates) from MAAP soil columns, after 6.5 weeks of leaching.

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #6		ug			
1	AVG.	124122.03	33118.35	23467.43	4556.94
	STD. DEV.	1820 15	560.18	440.11	192.62
	%REL. STD. DEV.	1.47	1.69	1.88	4.23
2	AVG.	10492.75	11357.21	5298.05	*
	STD. DEV.	222.01	186.85	537.24	-
	%REL. STD. DEV.	2.12	1.65	10.14	-
3	AVG.	*	3915.79	*	0.00
	STD. DEV.	-	75.99	-	0.00
	%REL. STD. DEV.	-	1.94	-	0.00
4	AVG.	*	3077.23	*	0.00
	STD. DEV.	-	30.61	-	0.00
	%REL. STD. DEV.	-	0.99	-	0.00
5	AVG.	*	3559.54	*	0.00
	STD. DEV.	-	182.93	-	0.00
	%REL. STD. DEV.	-	5.14	-	0.00
6	AVG.	*	17375.88	*	0.00
	STD. DEV.	-	10366.94	-	0.00
	%REL. STD. DEV.	-	59.66	-	0.00
7	AVG.	*	3092.38	0.00	0.00
	STD. DEV.	-	73.54	0.00	0.00
	%REL. STD. DEV.	-	2.38	0.00	0.00
8	AVG.	0.00	2475.08	0.00	0.00
	STD. DEV.	0.00	397.34	0.00	0.00
	%REL. STD. DEV.	0.00	16.05	0.00	0.00
9	AVG.	*	1782.38	0.00	0.00
	STD. DEV.	-	155.47	0.00	0.00
	%REL. STD. DEV.	-	8.72	0.00	0.00
10	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
11	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
12	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00

TABLE D-4.7 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #6		----------------------	ug	-------------------	
13	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
14	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
15	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
16	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
17	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
18	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
19	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
20	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
21	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
22	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
23	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
24	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00

TABLE D-4.7 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #6		----------------------	ug	----------------------	
25	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
26	AVG.	0.00	*	*	0.00
	STD. DEV.	0.00	-	-	0.00
	%REL. STD. DEV.	0.00	-	-	0.00
27	AVG.	0.00	*	*	0.00
	STD. DEV.	0.00	-	-	0.00
	%REL. STD. DEV.	0.00	-	-	0.00
COLUMN #10					
1	AVG.	136261.90	40728.99	27917.19	5427.30
	STD. DEV.	1545.37	1121.55	573.16	140.09
	%REL. STD. DEV.	1.13	2.75	2.05	2.58
2	AVG.	2843.13	5295.87	*	*
	STD. DEV.	1317.54	314.77	-	-
	%REL. STD. DEV.	46.34	5.94	-	-
3	AVG.	*	4234.25	*	0.00
	STD. DEV.	-	9.42	-	0.00
	%REL. STD. DEV.	-	0.22	-	0.00
4	AVG.	1105.73	2681.63	*	0.00
	STD. DEV.	28.94	35.21	-	0.00
	%REL. STD. DEV.	2.62	1.31	-	0.00
5	AVG.	*	2600.89	*	0.00
	STD. DEV.	-	21.04	-	0.00
	%REL. STD. DEV.	-	0.81	-	0.00
6	AVG.	*	3172.28	*	0.00
	STD. DEV.	-	27.29	-	0.00
	%REL. STD. DEV.	-	0.86	-	0.00
7	AVG.	*	3187.44	0.00	0.00
	STD. DEV.	-	185.68	0.00	0.00
	%REL. STD. DEV.	-	5.83	0.00	0.00
8	AVG.	*	2208.89	0.00	0.00
	STD. DEV.	-	114.07	0.00	0.00
	%REL. STD. DEV.	-	5.16	0.00	0.00

* No quantifiable concentrations of munition residues.

TABLE D-4.7 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #10		----------	ug	----------	
9	AVG.	*	2029.38	0.00	0.00
	STD. DEV.	-	131.09	0.00	0.00
	%REL. STD. DEV.	-	6.46	0.00	0.00
10	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
11	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
12	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
13	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
14	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
15	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
16	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
17	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
18	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
19	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
20	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00

TABLE D-4.7 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #10		ug			
21	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
22	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
23	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
24	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
25	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
26	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
27	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00

* No quantifiable concentrations of munition residues.

TABLE D-(.) Amounts (ug) of munition residues in each soil-core section (triplicates) from MAAP soil columns, after 13 weeks of leaching.

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #5		-------------------	ug	-------------------	
1	AVG.	128994.87	10532.55	26147.72	4914.86
	STD. DEV.	1599.77	69.62	1647.45	445.09
	%REL. STD. DEV.	1.24	0.66	6.30	9.06
2	AVG.	2532.57	2815.88	*	0.00
	STD. DEV.	39.07	60.62	-	0.00
	%REL. STD. DEV.	1.54	2.15	-	0.00
3	AVG.	994.90	2475.37	*	0.00
	STD. DEV.	51.28	21.28	-	0.00
	%REL. STD. DEV.	5.15	0.86	-	0.00
4	AVG.	*	3569.45	*	0.00
	STD. DEV.	-	91.37	-	0.00
	%REL. STD. DEV.	-	2.56	-	0.00
5	AVG.	*	3211.58	*	0.00
	STD. DEV.	-	49.55	-	0.00
	%REL. STD. DEV.	-	1.54	-	0.00
6	AVG.	*	4877.27	*	0.00
	STD. DEV.	-	95.75	-	0.00
	%REL. STD. DEV.	-	1.96	-	0.00
7	AVG.	*	4405.45	0.00	0.00
	STD. DEV.	-	19.43	0.00	0.00
	%REL. STD. DEV.	-	0.44	0.00	0.00
8	AVG.	*	5365.63	0.00	0.00
	STD. DEV.	-	99.13	0.00	0.00
	%REL. STD. DEV.	-	1.85	0.00	0.00
9	AVG.	*	4575.39	0.00	0.00
	STD. DEV.	-	90.41	0.00	0.00
	%REL. STD. DEV.	-	1.98	0.00	0.00
10	AVG.	*	3523.76	0.00	0.00
	STD. DEV.	-	195.09	0.00	0.00
	%REL. STD. DEV.	-	5.54	0.00	0.00
11	AVG.	*	2797.88	0.00	0.00
	STD. DEV.	-	2.56	0.00	0.00
	%REL. STD. DEV.	-	0.09	0.00	0.00

* No quantifiable concentrations of munition residues.

TABLE D-4.8 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #5		----------	ug	----------	
12	AVG.	0.00	2024.15	0.00	0.00
	STD. DEV.	0.00	134.32	0.00	0.00
	%REL. STD. DEV.	0.00	6.64	0.00	0.00
13	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
14	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
15	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
16	AVG.	0.00	2313.01	0.00	0.00
	STD. DEV.	0.00	87.80	0.00	0.00
	%REL. STD. DEV.	0.00	3.80	0.00	0.00
17	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
18	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
19	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
20	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
21	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
22	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00

* No quantifiable concentrations of munition residues.

TABLE D-4.8 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #5		ug			
23	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
24	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
25	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
26	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
27	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
COLUMN #8					
1	AVG.	131498.45	26388.66	32171.70	5631.71
	STD. DEV.	2472.26	782.97	1444.69	415.86
	%REL. STD. DEV.	1.88	2.97	4.49	7.38
2	AVG.	3579.45	4614.73	2009.17	*
	STD. DEV.	34.50	126.49	59.25	-
	%REL. STD. DEV.	0.96	2.74	2.95	-
3	AVG.	1434.00	3117.29	*	0.00
	STD. DEV.	29.26	20.87	-	0.00
	%REL. STD. DEV.	2.04	0.67	-	0.00
4	AVG.	1229.82	4253.05	*	0.00
	STD. DEV.	19.81	174.18	-	0.00
	%REL. STD. DEV.	1.61	4.10	-	0.00
5	AVG.	*	4287.36	*	0.00
	STD. DEV.	-	149.16	-	0.00
	%REL. STD. DEV.	-	3.48	-	0.00

* No quantifiable concentrations of munition residues.

TABLE D-4.8 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #8		....	.... ug	....	....
6	AVG.	*	4129.82	*	0.00
	STD. DEV.	-	188.80	-	0.00
	%REL. STD. DEV.	-	4.57	-	0.00
7	AVG.	*	5017.75	*	0.00
	STD. DEV.	-	79.21	-	0.00
	%REL. STD. DEV.	-	1.58	-	0.00
8	AVG.	*	5119.08	*	0.00
	STD. DEV.	-	134.39	-	0.00
	%REL. STD. DEV.	-	2.63	-	0.00
9	AVG.	0.00	4122.07	0.00	0.00
	STD. DEV.	0.00	163.27	0.00	0.00
	%REL. STD. DEV.	0.00	3.96	0.00	0.00
10	AVG.	0.00	3814.28	0.00	0.00
	STD. DEV.	0.00	213.58	0.00	0.00
	%REL. STD. DEV.	0.00	5.60	0.00	0.00
11	AVG.	0.00	3054.37	0.00	0.00
	STD. DEV.	0.00	142.70	0.00	0.00
	%REL. STD. DEV.	0.00	4.67	0.00	0.00
12	AVG.	0.00	2958.89	0.00	0.00
	STD. DEV.	0.00	77.50	0.00	0.00
	%REL. STD. DEV.	0.00	2.62	0.00	0.00
13	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
14	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
15	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
16	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00

* No quantifiable concentrations of munition residues.

TABLE D-4.8 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #8		----------	---------- ug	----------	----------
17	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
18	AVG.	0.00	2027.13	0.00	0.00
	STD. DEV.	0.00	86.03	0.00	0.00
	%REL. STD. DEV.	0.00	4.24	0.00	0.00
19	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
20	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
21	AVG.	0.00	2200.31	0.00	0.00
	STD. DEV.	0.00	52.61	0.00	0.00
	%REL. STD. DEV.	0.00	2.39	0.00	0.00
22	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
23	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
24	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
25	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
26	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
27	AVG.	0.00	1832.58	0.00	0.00
	STD. DEV.	0.00	280.36	0.00	0.00
	%REL. STD. DEV.	0.00	15.30	0.00	0.00

* No quantifiable concentrations of munition residues.

TABLE D-4.9. Amounts (ug) of munition residues in each soil-core section (triplicates) from MAAP soil columns, after 19.5 weeks of leaching.

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #3		ug			
1	AVG.	117905.80	11596.16	26223.40	4545.00
	STD. DEV.	2465.08	356.43	474.23	123.80
	%REL. STD. DEV.	2.09	3.07	1.81	2.72
2	AVG.	2784.02	3240.11	1516.41	*
	STD. DEV.	71.25	61.00	139.20	-
	%REL. STD. DEV.	2.56	1.88	9.18	-
3	AVG.	2195.53	3452.85	*	0.00
	STD. DEV.	65.05	155.55	-	0.00
	%REL. STD. DEV.	2.96	4.50	-	0.00
4	AVG.	1163.08	3050.95	*	0.00
	STD. DEV.	17.35	75.94	-	0.00
	%REL. STD. DEV.	1.49	2.49	-	0.00
5	AVG.	*	3634.07	0.00	0.00
	STD. DEV.	-	69.78	0.00	0.00
	%REL. STD. DEV.	-	1.92	0.00	0.00
6	AVG.	*	4334.21	0.00	0.00
	STD. DEV.	-	99.39	0.00	0.00
	%REL. STD. DEV.	-	2.29	0.00	0.00
7	AVG.	*	3152.63	0.00	0.00
	STD. DEV.	-	189.43	0.00	0.00
	%REL. STD. DEV.	-	6.01	0.00	0.00
8	AVG.	*	2926.54	0.00	0.00
	STD. DEV.	-	154.58	0.00	0.00
	%REL. STD. DEV.	-	5.28	0.00	0.00
9	AVG.	*	2852.33	0.00	0.00
	STD. DEV.	-	170.06	0.00	0.00
	%REL. STD. DEV.	-	5.96	0.00	0.00
10	AVG.	*	2871.14	0.00	0.00
	STD. DEV.	-	144.33	0.00	0.00
	%REL. STD. DEV.	-	5.03	0.00	0.00
11	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00

* No quantifiable concentrations of munition residues.

TABLE D-4.9. Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #3		----------	ug	----------	
12	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
13	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
14	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
15	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
16	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
17	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
18	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
19	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
20	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
21	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
22	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL STD. DEV.	0.00	-	0.00	0.00

* No quantifiable concentrations of munition residues.

TABLE D-4.9. Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #3		ug			
23	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
24	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
25	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
26	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
COLUMN #7					
1	AVG.	79614.12	7327.71	18515.63	3171.25
	STD. DEV.	622.38	140.40	342.66	89.05
	%REL. STD. DEV.	0.78	1.92	1.85	2.81
2	AVG.	9161.90	2422.18	2767.23	*
	STD. DEV.	104.40	20.39	216.94	-
	%REL. STD. DEV.	1.14	0.84	7.84	-
3	AVG.	7862.10	2559.52	1803.72	0.00
	STD. DEV.	136.00	397.84	25.07	0.00
	%REL. STD. DEV.	1.73	15.54	1.39	0.00
4	AVG.	5010.39	2307.27	*	*
	STD. DEV.	84.31	55.58	-	-
	%REL. STD. DEV.	1.68	2.41	-	-
5	AVG.	3509.26	1930.85	*	0.00
	STD. DEV.	56.30	36.45	-	0.00
	%REL. STD. DEV.	1.60	1.89	-	0.00
6	AVG.	3906.10	2266.38	*	0.00
	STD. DEV.	106.06	74.81	-	0.00
	%REL. STD. DEV.	2.72	3.30	-	0.00
7	AVG.	6919.66	*	*	*
	STD. DEV.	79.94	-	-	-
	%REL. STD. DEV.	1.16	-	-	-

* No quantifiable concentrations of munition residues.

TABLE D-4.9. Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #7		----------	ug	----------	
8	AVG.	4317.91	*	*	0.00
	STD. DEV.	109.73	-	-	0.00
	%REL. STD. DEV.	2.54	-	-	0.00
9	AVG.	2064.38	*	*	0.00
	STD. DEV.	34.21	-	-	0.00
	%REL. STD. DEV.	1.66	-	-	0.00
10	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
11	AVG.	*	1780.63	0.00	0.00
	STD. DEV.	-	57.63	0.00	0.00
	%REL. STD. DEV.	-	3.24	0.00	0.00
12	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
13	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
14	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
15	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
16	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
17	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
18	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
19	AVG.	*	*	*	0.00
	STD. DEV.	-	-	-	0.00
	%REL. STD. DEV.	-	-	-	0.00

* No quantifiable concentrations of munition residues.

TABLE D-4.9. Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #7		ug			
20	AVG.	*	*	*	0.00
	STD. DEV.	-	-	-	0.00
	%REL. STD. DEV.	-	-	-	0.00
21	AVG.	*	*	*	0.00
	STD. DEV.	-	-	-	0.00
	%REL. STD. DEV.	-	-	-	0.00
22	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
23	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
24	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
25	AVG.	*	*	*	0.00
	STD. DEV.	-	-	-	0.00
	%REL. STD. DEV.	-	-	-	0.00
26	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
27	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00

* No quantifiable concentrations of munition residues.

TABLE D-4.10 Amounts (ug) of munition residues in each soil-core section (triplicates) from MAAP soil columns, after 26 weeks of leaching.

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #1		-------------------	ug	-------------------	
1	AVG.	124879.67	5883.69	26769.24	4773.57
	STD. DEV.	1982.20	167.64	1274.28	226.72
	%REL. STD. DEV.	1.59	2.85	4.76	4.75
2	AVG.	2424.91	*	*	0.00
	STD. DEV.	48.90	-	-	0.00
	%REL. STD. DEV.	2.02	-	-	0.00
3	AVG.	1875.83	5526.00	*	0.00
	STD. DEV.	33.66	2549.25	-	0.00
	%REL. STD. DEV.	1.79	46.13	-	0.00
4	AVG.	1318.70	6114.95	*	0.00
	STD. DEV.	3.61	1809.28	-	0.00
	%REL. STD. DEV.	0.27	29.59	-	0.00
5	AVG.	1140.19	3776.54	0.00	0.00
	STD. DEV.	19.72	1138.48	0.00	0.00
	%REL. STD. DEV.	1.73	30.15	0.00	0.00
6	AVG.	1414.65	2901.37	*	0.00
	STD. DEV.	19.24	1310.73	-	0.00
	%REL. STD. DEV.	1.36	45.18	-	0.00
7	AVG.	774.06	*	0.00	0.00
	STD. DEV.	58.17	-	0.00	0.00
	%REL. STD. DEV.	7.51	-	0.00	0.00
8	AVG.	897.57	*	0.00	0.00
	STD. DEV.	13.64	-	0.00	0.00
	%REL. STD. DEV.	1.52	-	0.00	0.00
9	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
10	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
11	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00

* No quantifiable concentrations of munition residues.

TABLE D-4.10 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #1		----------	ug	----------	
12	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
13	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
14	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
15	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
16	AVG.	*	2038.37	0.00	0.00
	STD. DEV.	-	118.55	0.00	0.00
	%REL. STD. DEV.	-	5.82	0.00	0.00
17	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
18	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
19	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
20	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
21	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
22	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
23	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00

* No quantifiable concentrations of munition residues.

TABLE D-4.10 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #1		-------------------	ug	-------------------	
24	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
25	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
26	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
COLUMN #11					
1	AVG.	121692.09	7994.51	25591.96	4227.03
	STD. DEV.	1377.73	2125.98	991.87	222.97
	%REL. STD. DEV.	1.13	26.59	3.88	5.27
2	AVG.	4710.51	1948.55	1828.00	*
	STD. DEV.	90.40	127.60	31.31	-
	%REL. STD. DEV.	1.92	6.55	1.71	-
3	AVG.	2663.25	2558.04	*	*
	STD. DEV.	44.72	481.64	-	-
	%REL. STD. DEV.	1.68	18.83	-	-
4	AVG.	2304.17	1616.59	1264.56	*
	STD. DEV.	55.00	216.02	6.82	-
	%REL. STD. DEV.	2.39	13.36	0.54	-
5	AVG.	1789.67	*	*	0.00
	STD. DEV.	57.60	-	-	0.00
	%REL. STD. DEV.	3.22	-	-	0.00
6	AVG.	1138.74	*	*	0.00
	STD. DEV.	8.72	-	-	0.00
	%REL. STD. DEV.	0.77	-	-	0.00
7	AVG.	1090.27	*	0.00	0.00
	STD. DEV.	73.54	-	0.00	0.00
	%REL. STD. DEV.	6.74	-	0.00	0.00
8	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00

* No quantifiable concentrations of munition residues.

TABLE D-4.10 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #11		----------	ug	----------	
9	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
10	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
11	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
12	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
13	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
14	AVG.	*	*	0.00	0.00
	STD. DEV.	-	-	0.00	0.00
	%REL. STD. DEV.	-	-	0.00	0.00
15	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
16	AVG.	0.00	2447.56	0.00	0.00
	STD. DEV.	0.00	226.75	0.00	0.00
	%REL. STD. DEV.	0.00	9.26	0.00	0.00
17	AVG.	0.00	2400.86	0.00	0.00
	STD. DEV.	0.00	836.41	0.00	0.00
	%REL. STD. DEV.	0.00	34.84	0.00	0.00
18	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
19	AVG.	0.00	3468.40	0.00	0.00
	STD. DEV.	0.00	93.91	0.00	0.00
	%REL. STD. DEV.	0.00	2.71	0.00	0.00
20	AVG.	0.00	2755.34	0.00	0.00
	STD. DEV.	0.00	123.30	0.00	0.00
	%REL. STD. DEV.	0.00	4.47	0.00	0.00

* No quantifiable concentrations of munition residues.

TABLE D-4.10 Continued...

SAMPLE ID		HMX	RDX	2,4-DNT	2,6-DNT
Depth (inches; 2.54-cm sections)					
COLUMN #11		----------	ug	----------	
21	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
22	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
23	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
24	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
25	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
26	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00
27	AVG.	0.00	*	0.00	0.00
	STD. DEV.	0.00	-	0.00	0.00
	%REL. STD. DEV.	0.00	-	0.00	0.00

* No quantifiable concentrations of munition residues.